

## ***Appendix Q***

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# **Draft Clean Water Act Section 404(b)(1) Analysis Memorandum**

**Appendix Q – DRAFT CLEAN WATER ACT  
SECTION 404(b)(1) ANALYSIS MEMORANDUM**

**TERMINAL 4 REMOVAL ACTION  
PORT OF PORTLAND  
PORTLAND, OREGON**

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## ***Q-1. Introduction***

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In 2000, the United States Environmental Protection Agency (USEPA) added the Portland Harbor Superfund Site (Superfund Site or Site) to the National Priorities List (NPL) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9601, et seq. (CERCLA) (USEPA 2001). The Superfund Site Initial Study Area encompasses about 6 miles of the Willamette River in Portland, Oregon and includes the Terminal 4 facility. The Port of Portland (the Port) owns Terminal 4 and leases land there to several marine tenants.

In fall 2001, the USEPA and ten of the Superfund Site's potentially responsible parties entered into an Administrative Order on Consent for a Remedial Investigation/Feasibility Study of the Superfund Site, CERCLA-10-2001-240 (USEPA 2001). The Administrative Order on Consent allows Early Removal Actions to be conducted to address known contamination at specific locations within the Superfund Site. Contaminants found in Terminal 4 sediment samples during a remedial investigation directed by the Oregon Department of Environmental Quality (DEQ) led to a determination that a Removal Action at Terminal 4 is warranted. Accordingly, the Port is conducting a Non-Time-Critical Removal Action (NTCRA) under an Administrative Order on Consent for Removal Action (the AOC), CERCLA 10-2004-0009, executed by the Port and USEPA in October 2003.

As required by the AOC/SOW, the Port conducted a site characterization and evaluated potential Removal Action alternatives necessary to protect human health and the environment. Four Removal Action alternatives were identified, described and evaluated in the engineering evaluation/cost analysis (EE/CA) (BBL, 2004a, 2004b) in accordance with USEPA NTCRA evaluation criteria. Section Q-3 below describes each of the alternatives considered. Based on the EE/CA analysis, Alternative C was identified as the preferred Removal Action alternative (Preferred Alternative).

Each of the alternatives involves a combination of remedial technologies, including discharge of clean fill material for capping contaminated sediments, dredging contaminated sediments, and monitored natural recovery. The Preferred Alternative also includes construction of a confined disposal facility (CDF) in Slip 1. Construction of the CDF will require discharge of clean fill materials to construct containment components, and discharge of contaminated dredged sediments into the CDF for final isolation and disposal. The other Removal Action alternatives require disposal of contaminated dredged materials at an offsite regional upland landfill facility. Discharge of the fill materials for capping and the CDF results in a requirement for USEPA to evaluate the action based on guidelines in the Clean Water Act (CWA) Section 404(b)(1) (40 CFR 230 [2001]).

This document has been prepared to supplement the Terminal 4 EE/CA for the Removal Action. The AOC requires preparation of a CWA (Section 404) Analysis Memorandum. The AOC Scope of Work (Section 3) specifically states that the EE/CA will include "[p]reliminary drafts of the Biological Assessment and CWA Analysis Memorandum for the preferred Removal Action alternative."

This analysis memorandum is not intended to be the final documentation of the 404(b)(1) evaluation for the Removal Action at Terminal 4. Rather, it is intended to provide information necessary to demonstrate that the Preferred Alternative complies with the substantive requirements of Section 404(b)(1).

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Furthermore, this document is not intended to re-evaluate the alternatives against the NTCRA criteria for selection of the preferred Removal Action Alternative. The USEPA will supplement this draft 404(b)(1) Analysis Memorandum with their findings later in the process.

Based on discussions with USEPA, this document generally follows the format of the *Interim Final, Substantive Compliance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, Commencement Bay Nearshore/Tideflats Superfund Site, Tacoma, WA*. USEPA recommended this format because, like the Commencement Bay Nearshore/Tidal Flats (CB/NT) disposal sites, the proposed action occurs within the Portland Harbor Superfund Site and the nexus to harbor-wide issues is addressed.

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## ***Q-2. Purpose and Need for Proposed Action***

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The need for the proposed action is based on the presence of contaminated sediments in the Portland Harbor Superfund Site and, specifically, the Terminal 4 Removal Action Area. In some areas of the Terminal 4 Removal Action Area, concentrations of the contaminants exceed sediment quality guidelines (SQGs) that represent concentrations at which sediments may be toxic to benthic organisms that live in the sediments and experience direct exposure to contaminated sediments. Other forms of aquatic life, avian and mammalian wildlife, and humans may be indirectly exposed to sediment contaminants if they eat biota that have become contaminated from Removal Action Area sediments. As a result of the contaminated sediments, the need for a NTCRA was identified and the EE/CA was performed.

Removal Action Objectives (RAOs) identified for the Removal Action Area are to:

- Reduce ecological and human health risks associated with sediment contamination within the Removal Action Area to acceptable levels; and
- Reduce the likelihood of recontamination of sediments within the Removal Action Area.

The proposed action must also be considered in the context of the overall Superfund Site. USEPA Guidance requires removal actions “to avoid wasteful, repetitive, short-term actions that do not contribute to the efficient, cost-effective performance of a long-term remedial action” (USEPA, 1993). Thus the purpose includes maximizing the proposed action’s contribution to the efficient, cost-effective performance of the long-term remedial action of the overall Portland Harbor Superfund Site.

Terminal 4 is an active marine terminal. The Port’s maritime strategic objective is to serve the regional and national importers, exporters, and consumers by enhancing the Portland area’s role as a cost-competitive gateway for bulk cargo and automobiles and improve Portland’s niche as a regional container and general cargo port. The Port’s long-range goal is to promote regional economic vitality in an environmentally sustainable fashion. Terminal 4 is integral to achieving these objectives. Thus the Removal Action must achieve the RAOs in a manner that is consistent with the maritime uses at Terminal 4 and minimize the disruption to tenant operations during implementation of the Removal Action.

In summary, the purpose of the proposed action is to remediate contaminated sediments in the Removal Action Area consistent with the RAOs in a manner supportive of the overall cleanup of the Portland Harbor Superfund Site and consistent with the current and future maritime uses at Terminal 4. This document evaluates the Removal Action Alternatives with respect to the discharge of fill materials for capping and the CDF berm construction and the discharge of contaminated sediments into the CDF.

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## **Q-3. Proposed Action**

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Section 3 of the AOC Scope of Work requires the EE/CA to include a preliminary draft of the CWA Analysis Memorandum for the Preferred Alternative. Ultimately, USEPA will prepare the final 404(b)(1) evaluation of the selected alternative. For purposes of this preliminary draft, the proposed action is the Preferred Alternative (Alternative C). Because the 404(b)(1) Guidelines require EPA to examine practicable alternatives to the proposed discharge, this section summarizes all four alternatives considered in the EE/CA. Section 7 of the EE/CA provides additional detailed description of the conceptual design and underlying rationale for each alternative.

### **Q-3.1 Location**

The Removal Action Area is within the Port's Terminal 4 facility located at 11040 North Lombard Street in Portland, Oregon. The Removal Action Area lies within the Portland Harbor Superfund Site (Figure Q-1). The Removal Action Area and the Portland Harbor Superfund Site are defined in the AOC as follows:

- Portland Harbor Superfund Site or "Superfund Site" or "Site" shall mean the Portland Harbor Superfund Site, in Portland, Multnomah County, Oregon, listed on the National Priorities List (NPL) on December 1, 2000, 65 Fed. Reg. 75179-01. The Site consists of the aerial extent of contamination, including all suitable areas in proximity to the contamination necessary for implementation of response action, at, from and to the Portland Harbor Superfund Site Assessment Area from approximately River Mile 3.5 to River Mile 9.2 (Assessment Area), including uplands portions of the Site that contain sources of contamination to the sediments at, on or within the Willamette River. The boundaries of the Site will be initially determined upon issuance of a Record of Decision for the Portland Harbor Superfund Site.
- Removal Action Area or "Terminal 4 Removal Action Area" shall mean that portion of the Site adjacent to and within the Port of Portland's Terminal 4 at 11040 North Lombard, Portland, Multnomah County, Oregon: extending west from the ordinary high water line on the northeast bank of the Lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay.

### **Q-3.2 Description of Discharge Sites**

For the purposes of characterizing the Removal Action Area and describing the Removal Action alternatives, BBL (2004b) subdivided Terminal 4 into five subareas based on an initial evaluation of sediment chemistry and operational/engineering considerations, as follows:

- Berth 401;

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- Slip 1;
  - Wheeler Bay;
  - Slip 3; and
  - North of Berth 414.

The EE/CA evaluated four Removal Action alternatives according to USEPA guidance criteria for NTCRAs, which includes effectiveness, implementability, and cost. The EE/CA identified a Preferred Alternative based on this comparative analysis. A summary of each of the Removal Action alternatives is presented in the following section.

### **Q-3.3 Summary of Alternatives**

Each of the Removal Action alternatives incorporates a combination of technologies including capping, dredging, and monitored natural recovery (MNR). Table Q-1 summarizes the preliminary design estimates of acreage and volume of materials to be dredged, capped, or designated for MNR for each of the alternatives. The schematic diagrams in Figures Q-2 to Q-5 show the areas where application of each technology is proposed for the four alternatives. The following sections summarize each of the Removal Action alternatives.

#### **Q-3.3.1 Alternative A: Monitored Natural Recovery (MNR) Emphasis**

Alternative A consists of a combination of MNR and capping in Slip 1, Wheeler Bay, and Berth 401; MNR North of Berth 414; and a combination of dredging, capping, and MNR in Slip 3 (Figure Q-2). Operationally, Pier 4 in Slip 3, the barge leg in Slip 1, and Berth 408 and 401 will remain active. In Slip 1, the pier decks and pier framework at Berths 405 and 408 will be demolished. Affected outfalls will be modified to accommodate changes due to capping or dredging (primarily by extending piping and reconstructing the outfall). For this alternative, 15.9 acres are proposed for MNR, 9.2 acres are proposed for dredging, and 20 acres are proposed for capping. The discharge of fill materials will be limited to clean fill materials used in capping. Disposal of contaminated dredged materials would occur at an USEPA-approved landfill at an offsite location. A more detailed description of the activities in each subarea follows.

##### **Slip 1 – Combination of Monitored Natural Recovery and Capping**

The Removal Action in Slip 1 consists of MNR and capping. The pier decks and framework at Berths 405 and 408 will be demolished. A new barge docking facility is installed to replace the Berth 408 pier and to keep the bulk liquid cargo facility operational.

##### **Slip 3 – Combination of Dredging, Capping, and Monitored Natural Recovery**

The Removal Action in Slip 3 consists of a combination of dredging, capping, and a relatively small area of MNR (i.e., the underpier area at Berth 410 below the finger pier portion). The area at Pier 5 is capped,

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while the area between Pier 4 and Pier 5 is dredged. Dredging is performed in front of Pier 4 to remove contamination. Capping is impractical due to the need to maintain ship access to the actively used Berths 410 and 411. The nearshore slopes under Pier 4 at Berth 411 are capped. Dredging under this pier is impractical due to the presence of riprap. Some dredging, but primarily capping, is used in a relatively small slope area at the head of Slip 3 below the existing pinch pile bulkhead. Dredging in this area would decrease the stability of the slope. Barge-to-rail transloading of dredged sediments could potentially be performed using the rail spurs at Berths 410/411 (i.e., Kinder Morgan facility). Kinder Morgan's operations would be shut down during dredging in Slip 3.

### **Wheeler Bay – Monitored Natural Recovery and Capping**

Since contaminant concentrations identified in most of Wheeler Bay are low, MNR is used for the majority of Wheeler Bay. A portion of the slope is capped as shown on the figure because of higher PAH concentrations in one sample location.

### **North of Berth 414 – Monitored Natural Recovery**

Similar to Wheeler Bay, low contaminant concentrations were found in the North of Berth 414 subarea up to 22 feet below the sediment surface. Therefore, MNR is used north of Berth 414.

### **Berth 401 – Monitored Natural Recovery and Capping**

MNR is used for the majority of the area at Berth 401 because of low contaminant concentrations. A relatively small area in the northeast corner of the Berth 401 area is capped because of marginal PCB concentrations in one sample location.

## **Q-3.3.2 Alternative B: Cap Emphasis**

Alternative B is similar to Alternative A, but has a greater reliance on capping in Slip 1. Alternative B consists of a combination of capping and MNR in Slip 1, Wheeler Bay, and Berth 401; MNR North of Berth 414; and a combination of dredging, capping, and MNR in Slip 3 (Figure Q-3). Operationally, Pier 4 in Slip 3, the barge leg in Slip 1, and Berth 401 remain active. The pier decks and pier framework at Berths 405 and 408 will be demolished. Affected outfalls would be modified to accommodate changes due to capping or dredging (primarily by extending piping and reconstructing the outfall). For this alternative, 11.7 acres are proposed for MNR, 9.2 acres are proposed for dredging, and 24.2 acres are proposed for capping. The discharge of fill materials will be limited to clean fill materials used in capping. Disposal of contaminated dredged materials would occur at an USEPA-approved landfill at an offsite location. A more detailed description of the activities in each subarea follows.

### **Slip 1 – Combination of Monitored Natural Capping and Recovery**

The Removal Action in Slip 1 consists of capping, with a small area of MNR at the mouth of the slip. The pier decks and framework at Berths 405 and 408 will be demolished. A new barge docking facility is installed to replace the Berth 408 pier and to keep the bulk liquid cargo facility operational.

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### **Slip 3 – Combination of Dredging, Capping, and Monitored Natural Recovery**

The Removal Action in Slip 3 consists of a combination of dredging, capping, and a relatively small area of MNR (i.e., the underpier area at Berth 410 below the finger pier portion). The area at Pier 5 is capped, while the area between Pier 4 and Pier 5 is dredged. Dredging is performed in front of Pier 4 to remove contamination. Capping is impractical due to the need to maintain ship access to the actively used Berths 410 and 411. The nearshore slopes under Pier 4 at Berth 411 are capped. Dredging under this pier is impractical due to the presence of riprap. Some dredging, but primarily capping, is used in a relatively small slope area at the head of Slip 3 below the existing pinch pile bulkhead. Dredging in this area would decrease the stability of the slope. Barge-to-rail transloading of dredged sediments could potentially be performed using the rail spurs at Berths 410/411 (i.e., Kinder Morgan facility). Kinder Morgan's operations would be shut down during dredging in Slip 3.

### **Wheeler Bay – Monitored Natural Recovery and Capping**

Since contaminant concentrations identified in most of Wheeler Bay are low, MNR is used for the majority of Wheeler Bay. A portion of the slope is capped as shown on the figure because of higher PAH concentrations in one sample location.

### **North of Berth 414 – Monitored Natural Recovery**

Similar to Wheeler Bay, low contaminant concentrations were found in the North of Berth 414 subarea up to 22 feet below the sediment surface. Therefore, MNR is used north of Berth 414.

### **Berth 401 – Monitored Natural Recovery and Capping**

MNR is used for the majority of the area at Berth 401 because of low contaminant concentrations. A relatively small area in the northeast corner of the Berth 401 area is capped because of marginal PCB concentrations in one sample location.

## **Q-3.3.3 Alternative C: Dredge Emphasis with CDF Disposal–At-Grade Full-Size CDF**

Alternative C consists of constructing an at-grade CDF in Slip 1; a combination of dredging, capping, and monitored natural attenuation (MNR) in Slip 3; a combination of MNR and capping in Wheeler Bay and Berth 401; and MNR North of Berth 414 (Figure Q-4). Operationally, Pier 4 in Slip 3 and Berth 401 remain active. The grain facility barge leg and the International Raw Materials barge operations in Slip 1 would be relocated. The pier decks and pier framework at Berths 405 and 408 will be demolished, including pulling/breaking timber piles and providing upland disposal of timber piling and construction debris. Outfalls that currently discharge to Slip 1 will be relocated and rerouted. Former storm sewer piping discharge to Slip 1 will be abandoned. For this alternative, 10.9 acres are proposed for MNR, 10.2 acres are proposed for dredging, 8.7 acres are proposed for capping, and 15.3 acres would be occupied by the at-grade CDF. Discharge of clean fill materials would occur in capped areas. Discharge of contaminated dredged materials would occur in the CDF constructed in Slip 1. A more detailed description of the activities in each sub area follows.

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### **Slip 1 – Full At-Grade Confined Disposal Facility (CDF)**

An at-grade CDF is constructed in Slip 1 and sediment dredged in Slip 3 is disposed of in the Slip 1 CDF. The CDF has excess capacity available for other dredged sediment from the Portland Harbor Superfund Site. By constructing the CDF to an at-grade surface, the newly gained land can be used for water-dependent commercial purposes. An earthen containment berm is constructed at the mouth of Slip 1 to serve as an isolation/retaining structure for the dredged sediment. The area under the containment berm is dredged. The Port would acquire State of Oregon property for the purpose of constructing the CDF. The Department of State Land (DSL) has indicated a willingness to sell its portion of the land to the Port.

### **Slip 3 – Combination of Dredging, Capping, and Monitored Natural Recovery**

The Removal Action in Slip 3 consists of a combination of dredging, capping, and a relatively small area of MNR (i.e., the under-pier area at Berth 410 below the finger pier portion). The area at Pier 5 is capped, while the area between Pier 4 and Pier 5 is dredged. Dredging is performed in front of Pier 4 to remove contamination. Capping is impractical due to the need to maintain ship access to the actively used Berths 410 and 411. The nearshore slopes under Pier 4 at Berth 411 are capped. Dredging under this pier is impractical due to the presence of riprap. Some dredging, but primarily capping, is used at a relatively small slope area at the head of Slip 3 below the existing pinch pile bulkhead. Dredging in this area would decrease the stability of the slope. Kinder Morgan's operations would be shut down during dredging of Slip 3, but for less time than the other alternatives. Dredged sediments from Slip 3 are disposed of in Slip 1 CDF.

### **Wheeler Bay – Monitored Natural Recovery and Capping**

Since contaminant concentrations identified in most of Wheeler Bay are low, MNR is used for the majority of Wheeler Bay. A portion of the slope is capped as shown on the figure because of higher PAH concentrations in one sample location.

### **North of Berth 414 – Monitored Natural Recovery**

Similar to Wheeler Bay, low contaminant concentrations were found in the North of Berth 414 subarea up to 22 feet below the sediment surface. Therefore, MNR is used north of Berth 414.

### **Berth 401 – Monitored Natural Recovery and Capping**

MNR is used for the majority of the area at Berth 401 because of low contaminant concentrations. A relatively small area in the northeast corner of the Berth 401 area would be capped because of marginal PCB concentrations in one sample location.

## **Q-3.3.4 Alternative D: Dredge Emphasis with Landfill Disposal**

Alternative D consists of a combination of dredging and capping in Slip 3, MNR and capping in Berth 401, and Wheeler Bay and MNR North of Berth 414. Slip 1 would be dredged. Operationally, Pier 4 in Slip 3, the barge leg in Slip 1, and Berth 401 will remain active (Figure Q-5). To facilitate dredging, piers that are not required to sustain barge docking operations will be demolished. Removal of timber piles would be accomplished by pulling the piles, followed by upland disposal of the piles at an appropriate upland disposal facility. Outfalls would be modified as needed to facilitate dredging. For this alternative,

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11.7 acres are proposed for MNR, 24.7 acres are proposed for dredging, and 8.7 acres are proposed for capping. Under this alternative, the discharge of fill materials would be limited to clean fill materials used in those areas to be capped. Disposal of dredged materials would occur at an USEPA-approved landfill at an offsite location. A more detailed description of the activities in each subarea follows.

#### **Slip 1 – Dredging and Monitored Natural Recovery**

The Removal Action in Slip 1 consists of dredging except at the mouth of the slip, where the Removal Action consists of MNR. Dredging requires demolition of warehouses and pier structures in Slip 1, including removal of piles. A new barge docking facility is installed to replace the Berth 408 pier and to keep the bulk cargo facility operational.

#### **Slip 3 – Combination of Dredging, Capping, and Monitored Natural Recovery**

The Removal Action in Slip 3 consists of a combination of dredging, capping, and a relatively small area of MNR (i.e., the underpier area at Berth 410 below the finger pier portion). The area at Pier 5 is capped, while the area between Pier 4 and Pier 5 is dredged. Dredging is performed in front of Pier 4 to remove contamination. Capping is impractical due to the need to maintain ship access to the actively used Berths 410 and 411. The nearshore slopes under Pier 4 at Berth 411 are capped. Dredging under this pier is impractical due to the presence of riprap. Some dredging, but primarily capping, is used in a relatively small slope area at the head of Slip 3 below the existing pinch pile bulkhead. Dredging in this area would decrease the stability of the slope. Barge-to-rail transloading of dredged sediments could potentially be performed using the rail spurs at Berths 410/411 (i.e., Kinder Morgan facility). Kinder Morgan's operations would be shut down during dredging in Slip 3.

#### **Wheeler Bay – Monitored Natural Recovery and Capping**

Since contaminant concentrations identified in most of Wheeler Bay are low, MNR is used for the majority of Wheeler Bay. A portion of the slope is capped as shown on the figure because of higher PAH concentrations in one sample location.

#### **North of Berth 414 – Monitored Natural Recovery**

Similar to Wheeler Bay, low contaminant concentrations were found in the North of Berth 414 subarea up to 22 feet below the sediment surface. Therefore, MNR is used north of Berth 414.

#### **Berth 401 – Monitored Natural Recovery and Capping**

MNR is used for the majority of the area at Berth 401 because of low contaminant concentrations. A relatively small area in the northeast corner of the Berth 401 area is capped because of marginal PCB concentrations in one sample exploration.

### **Q-3.4 Method of Discharge**

Overall, two types of discharge are considered, discharge of clean fill material for capping and construction of the CDF containment berm and discharge of contaminated sediments in the CDF. Each of the alternatives involves capping and the associated discharge of clean fill. Alternative C includes

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discharge of contaminated sediment into the CDF for disposal, and discharge of clean material for capping and for construction of the CDF containment berm.

For the placement of contaminated dredged materials into the CDF, the initial conceptual design evaluated in the EE/CA proposes to use either mechanical dredging (clamshell bucket) or hydraulic dredging, or a combination of the two methods. If mechanical dredging is used, the material will be placed in a barge and transported to the CDF. Sediments will then be pumped from the barge into the CDF using pumps capable of moving high solid-content materials. If hydraulic dredging is used, the material will be pumped directly from the dredged area via pipes to the CDF in Slip 1. Most likely, a combination of hydraulic and mechanical dredging will be used due to the potential to encounter debris and the engineering constraints in some areas of Slip 3 that may not be conducive to hydraulic dredging.

Capping of sediment outside the CDF is likely to be conducted using a different sediment delivery process. Although it is expected that the cap will consist of a 3-foot thick layer of sands or other appropriately sized cap materials, the preferred method for placement of cap materials has not been selected. Options considered for placing cap materials include:

- **Clamshell placement releasing material in proximity of the river bottom:** The material is placed with a relatively high level of accuracy (both vertically and horizontally) and with relatively little impact to water quality in terms of resuspension of sediment or release of the cap material. This method has a relatively low production rate.
- **Clamshell placement releasing material below the water surface:** The material is placed at a higher production rate than is the case with placement near the river bottom; however, the accuracy of the placement is not as great. The potential impact to water quality is greater than with placement near the river bottom.
- **Barge dumping placement:** Relatively large amounts of cap material can be placed with bottom opening barges, which may open across the hull or have hatches that open to release the cap material. Either method allows a high production rate. Relatively accurate placement of the material can be achieved by sequencing the opening of the barge hatches. Water quality impacts are similar to those associated with clamshell placement of cap material close to the mudline.
- **Tremie piping/pumping placement:** The cap material is typically piped in a slurry form directly onto the river bottom. This placement technique provides good accuracy and relatively low impact to water quality. This method is best for the placement of fine-grained cap material.
- **Sand wash technology:** The cap material is placed on the deck of a barge over the intended area of placement and washed overboard. This method is suitable for very soft or unstable river bottoms where clamshell placement may cause resuspension or release of contamination. The water quality impact is greater with this technique, because the cap material travels across the entire water column to reach its target area.

Each of these options represents proven technologies that are commonly used in capping sediments.

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### **Q-3.5 Timing of Discharge**

The schedule of construction activities associated with the implementation of the Removal Action will be developed during design. The schedule will take into account Port and tenant operations considerations, site improvements associated with implementation of the removal action, availability of materials, contractors and services, as well as in-water construction periods. Based on similar size and nature of projects performed in the Pacific Northwest, anticipated project durations for the various Removal Action alternatives are presented below.

For Alternatives A and B, dredging in Slip 3 and capping in areas outside Slip 3 would occur in Year 1. Miscellaneous other work such as demolition of pier decks and pier frameworks would occur prior to capping in Slip 1. Capping of under pier areas in Slip 3 would occur in Year 2. Monitoring in MNR areas would continue for 5 years after construction is complete. If concentrations of contaminants of concern (COCs) in sediment have not declined to acceptable levels, additional removal action may be necessary.

For Alternative C, the Removal Action will likely be performed during two to three construction seasons (2-3 years). No in-water work is expected to occur during peak migration periods for salmonids. During Year 1, berm construction would begin and capping in Wheeler Bay and Berth 401 would be conducted simultaneously. Miscellaneous other work such as demolition of piers and warehouses would also be conducted. In Year 2, dredging in Slip 3 would begin. Year 3 would include a second stage of berm construction and capping in Slip 3 near the head of the Slip on small slopes. Monitoring in MNR areas would be the same as for Removal Action Alternatives A and B.

For Alternative D, dredging in Slip 1 and Slip 3 would occur in Year 1. Miscellaneous other work such as demolition of piers decks and pier frameworks would occur prior to capping in Slip 1. Capping of under pier areas in Slip 3 and capping in Wheeler Bay and at Berth 401 would occur in Year 2. Monitoring in MNR areas would be the same as for Removal Action Alternatives A and B.

### **Q-3.6 Sources and General Characteristics of Material**

The sources of capping and CDF construction materials will be identified based on criteria identified during the design process. For example, if Columbia River sand is suitable, it may be used for capping. Generally, it is expected that sand will be used for capping and larger material (3-inch minus and/or riprap) will be used for scour protection. Characteristics of the CDF berm construction materials would consist of sand and gravel.

### **Q-3.7 Quantity of Material**

Capping using clean fill materials will result in the discharge of 96,500 cy for Alternative A, 117,000 cy for Alternative B, 42,000 cy for Alternative C, and 42,000 cy for Alternative D. Construction of the

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containment berm for the CDF in Alternative C will require placement of 138,500 cy of clean material. The cap for the CDF would require about 255,000 cy of clean material. Discharge of contaminated sediments into the CDF would initially involve the discharge of 105,000 cy of contaminated sediments dredged from Slip 3. In addition, approximately 10,000 cy of contaminated sediments will be removed from Slip 1 to prepare for placement of the berm. The CDF would have excess capacity for an additional 560,000 cy of contaminated materials dredged from the Portland Harbor Superfund Site.

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## ***Q-4. Aquatic Resource Impact Evaluation Criteria***

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The EE/CA provides an evaluation of the Removal Action alternatives and identifies a Preferred Alternative based on evaluation criteria in the NTCRA guidance (USEPA 1993). The 404(b)(1) Guidelines also require evaluation of the aquatic impacts associated with the Preferred Alternative. The purpose of the Guidelines “is to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material.” 40 CFR § 230.1(a). Specifically, “dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact.” 40 CFR § 230.1(c).

For the CB/NT, USEPA developed a list of required site- or situation-specific criteria for evaluating compliance with the 404(b)(1) Guidelines. The conditions listed below were adapted for the Terminal 4 Removal Action from USEPA’s list.

### **Q-4.1 Disposal Site Availability**

Pursuant to the 404(b)(1) Guidelines, disposal sites must be available to meet the project purpose. The Guidelines state, “an area not presently owned by the applicant, which could be reasonably obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered.” In this case, the Port is considered to be the “applicant” pursuant to the Guidelines.

In the CB/NT 404(b)(1) process, USEPA determined that a disposal site was available if it is owned or could be reasonably obtained, used, expanded or managed by the potentially responsible party (PRP).

### **Q-4.2 Cost Effectiveness**

Pursuant to the Guidelines, a determination of practicability must consider if a disposal option can be accomplished at a reasonable cost. The Guidelines do not provide threshold determinations for ‘reasonable’ costs. Rather, USEPA and the Army Corps of Engineers regulation and policy encourage USEPA to establish a reasonable range of costs to meet the project purpose. One way to accomplish this is to determine whether the cost of an action is consistent with costs for similar actions.

However, under CERCLA, USEPA also must consider whether or not an action or a remedy provides effectiveness proportional to its costs. As with the Guidelines, there is no threshold determination for cost effectiveness. Rather, USEPA is under strong directive to carefully determine what costs are warranted to achieve the goals of a cleanup action. In this case, disposal is part of the Removal Action at Terminal 4 and, the remedy for cleanup in the Portland Harbor Superfund Site. To determine cost effectiveness of each disposal option, the costs of the option and its protectiveness in comparison with other protective disposal options were considered, in light of the overall project purpose. Based on USEPA experience at the CB/NT

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site and other large contaminated sediment Superfund sites, having one or more onsite disposal options helps promote a competitive market for disposal of dredged contaminated sediments, which in turn promotes a cost-effective, efficient cleanup of the Superfund site.

### **Q-4.3 Feasibility**

For all alternatives, construction must be technically and logistically possible using “existing technology.”

### **Q-4.4 Avoid or Minimize Impacts to the Aquatic Environment**

In evaluating whether a specific discharge site may be selected, USEPA is required to examine other practicable alternatives to the proposed discharge, which may include not discharging or discharging at a different aquatic site [40 CFR § 230.5]. The Guidelines state that discharge of dredge or fill material is not permitted “if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences” [40 CFR § 230.10(a)]. An alternative is considered practicable “if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.” That is, if there are disposal sites that meet the overall project purposes and do not have other significant adverse environmental consequences, then the least environmentally damaging option will be the highest priority for selection.

Since detailed design work is not yet available for areas considered under this evaluation, the aquatic impacts estimated in this analysis represent a ‘worst case’ situation using the preliminary design estimates. Specific conservation measures to avoid and minimize construction impacts will be developed during the remedial design (RD) phase. Preliminary conservation measures that should be considered in developing the final plan to minimize construction impacts are presented in Section Q-7 below.

To the extent that the Removal Action ultimately selected results in an unavoidable net loss in terms of the relative function and value of habitat, the loss will be evaluated and mitigated, as appropriate, in accordance with applicable federal and state ARARs.

### **Q-4.5 Conservation and Recovery**

Under Section 7(a) of the Endangered Species Act (ESA), all federal agencies are directed to utilize their authorities to support the conservation and recovery of endangered or threatened species. In addition, the Guidelines also prohibit any action that would jeopardize the existence of federally listed species or which results in the destruction or adverse modification of critical habitat for listed species [40 CFR §230.10(b)]. USEPA’s overall goal is to avoid jeopardy to listed species through pursuit of cleanup actions that support the

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conservation and recovery of ESA listed species, particularly with regard to salmonid habitat. This criterion focuses on assessing and implementing conservation and mitigation opportunities in the Lower Willamette River and adjoining areas, in contrast to considering solely the habitat loss associated with an individual alternative proposal.

#### **Q-4.6 Limit Number of Sites**

Dredging contaminated sediments at Terminal 4 and other locations in the Portland Harbor Superfund Site will require disposal of those sediments. At the CB/NT Superfund Site, USEPA recognized that finding disposal sites and mitigating for adverse effects required a Commencement Bay-wide approach beyond the individual waterways. Based on input from the public, USEPA sought to minimize the number of disposal sites by maximizing the capacity of CDFs constructed in nearby waterways, including Blair Slip 1 and the CDF constructed in the St. Paul Waterway. USEPA chose CDFs for the disposal of most of the contaminated material dredged from the waterways, with construction of a nearby landfill identified for a small portion of the most contaminated material. This approach also minimized the overall impact and reduced the environmental impacts and potential public safety implications associated with transport of materials to offsite disposal facilities from the various waterways at the CB/NT Superfund Site.

Similarly, establishing an in-water disposal site within the Portland Harbor Superfund Site would minimize the overall impact and reduce the environmental impacts and potential public safety implications associated with transport of materials to offsite disposal facilities. Having one or more disposal options within the Superfund Site also helps control the costs of disposal for offsite disposal facilities because it creates a more competitive market for disposal. This, in turn, makes dredging a more cost-effective remedy and encourages the consolidation of the contaminated sediments into a limited number of locations, rather than having numerous disposal sites or caps scattered throughout the Superfund Site.

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## ***Q-5. Analysis of Disposal Alternatives Pursuant to Site Criteria***

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The following sections present an analysis of the Removal Action alternatives relative to the criteria described in the previous section. Whether an alternative is “practicable” considers costs, technology, and feasibility as well as each alternative’s ability to meet the overall project purposes. The overall project purposes are to remediate contaminated sediments in the Removal Action Area consistent with the RAOs in a manner supportive of the overall cleanup of the Portland Harbor Superfund Site and consistent with the current and future maritime uses at Terminal 4.

### **Q-5.1 Site Availability**

#### **Offsite Landfill Disposal (Alternatives A, B, and D)**

Alternatives A, B and D include offsite disposal of dredged materials from the Terminal 4 Removal Action Area at an upland landfill.

Any upland landfill that has received USEPA approval to accept material of the type to be dredged from the Removal Action Area can be used for the offsite disposal component of a Removal Action alternative. Several appropriately licensed landfills are within 120 miles of the Removal Action Area; therefore, offsite disposal of dredged sediments is available.

#### **Disposal in Confined Disposal Facility (Preferred Alternative - Alternative C)**

For the Preferred Alternative, Slip 1 was identified as a site for construction of a CDF. The eastern portion of the slip is owned by the Port and is readily available for construction of an at-grade CDF. The western portion of the slip is owned by the State of Oregon and a portion of the CDF would be constructed on State of Oregon property, resulting in a need for administrative coordination and, ultimately, transfer of property rights to the Port. Any agreements needed between DSL and the Port for work to be done on State of Oregon land will be negotiated between the Port and DSL prior to implementation of the Removal Action.

The Port is willing to make Slip 1 available for the stated purpose. The finished fill will create 17 acres of useable land that would support marine commerce and terminal operations facilities present within Slip 1. Construction of the CDF in Slip 1 would also provide an opportunity for the Port to improve the marine facilities for tenants at Terminal 4 by shifting bulk loading and unloading operations from berths in Slip 1, to berths on the main navigation channel. The Port’s overall business strategy is to operate in an environmentally sustainable fashion. Cleanup and disposal of contaminated sediments in the Removal Action Area and creation of a cost-effective and environmentally protective disposal facility within the Superfund Site are consistent with this overall strategy.

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## Findings on site availability– Reserved for USEPA

### Q-5.2 Cost Effectiveness

Disposal of contaminated dredged sediments in approved upland landfills is generally considered cost-effective for small to midsized dredging projects. Recent project examples in the Pacific Northwest (such as the Lockheed, Todd Shipyard, East Duwamish and Hylebos-Atofina projects) selected the disposal of contaminated dredged sediments at an USEPA approved upland landfill. These projects involve sediment volumes in the order of 100 to 200,000 cubic yards. Upland disposal for these projects was also facilitated by available rail-haul to the landfill as well as the landfill being allowed to accept wet waste, which makes it a desirable target for sediment disposal. Projects involving larger volumes of sediment, for example the Milwaukee Waterway remediation or the Thea Foss Wheeler Osgood Waterways and the Hylebos Segment Five remediation projects, involved the construction of CDFs to dispose of dredged sediments.

The available regional upland offsite landfills are known to have adequate capacity and operational lifetime to accommodate the dredged materials from the Removal Action Area. The costs projected for disposal were based on the range of costs that the Port has recently paid for similar disposal (See EE/CA Appendix O, Section O.3.4 for additional detail on cost assumptions). Thus, estimated disposal costs for Alternatives A, B, and D are within traditional and acceptable ranges and consistent with CERCLA 104(a)(2).

The estimated Removal Action costs for Alternatives A, B and D, including present value adjustments on operation and maintenance (O&M) and other periodic costs, are as follows (See EE/CA Appendix O for further details):

- |  |              |
|--|--------------|
| • Alternative A – MNR Emphasis:                        | \$23,303,000 |
| • Alternative B – Capping Emphasis:                    | \$24,627,000 |
| • Alternative D – Dredging Emphasis/Landfill Disposal: | \$26,431,000 |

While disposal of the Terminal 4 sediments at an upland landfill are projected to be within traditional and acceptable ranges, the Terminal 4 Removal Action is part of the larger Portland Harbor Superfund Site. USEPA must consider that the cleanup of other locations within the Portland Harbor Superfund Site will be dependent on the availability of cost-effective disposal sites. While upland landfills can accommodate some dredged material and may be appropriate for one individual location, it may not be possible to accommodate all material proposed for dredging. Moreover, if only one disposal option is available for the Portland Harbor Superfund Site as a whole (e.g. upland landfill), the cost of such disposal may increase dramatically with decreased competition and increased demand. Demand is anticipated to increase because there are currently two PRPs (the Port and NW Natural). Removal action is being negotiated for at least one other site in the Superfund site.

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While the initial construction costs for the Preferred Alternative are higher than for other alternatives, the CDF in Slip 1 will have substantial excess capacity that can be used for cost-effective disposal of dredged sediments from other locations in the Portland Harbor Superfund Site. The dredged sediments from Terminal 4 are estimated at 115,000 cubic yards. This leaves approximately 560,000 cy of excess capacity that would be available for disposal of contaminated dredged sediments from other locations in the Portland Harbor Superfund Site. The value of this excess capacity will offset initial construction costs. When the net cost is considered, the Preferred Alternative will have costs that are lower than the other alternatives (See Appendix O, Section O.3.5 for details of cost assumptions.) The estimated Removal Action costs for the Preferred Alternative, including present value adjustments on O&M and other periodic costs, are as follows:

- The Preferred Alternative – Dredging Emphasis/CDF Disposal: \$30,555,000
  - The Preferred Alternative – including excess capacity value: \$20,555,000

Not all contaminated dredged materials would be compatible or appropriate for disposal in the proposed CDF. However, the types of contaminants and relative concentrations in Terminal 4 sediments are common to other parts of the Superfund Site and it is reasonable to expect that, after appropriate analyses, the Slip 1 CDF would be deemed a suitable disposal site for a substantial quantity of contaminated dredged sediments from other locations within the Portland Harbor Superfund Site. Moreover, making an onsite disposal option available in the Superfund Site is expected to foster a competitive market for disposal at upland landfills which will, in turn, provide more cost-effective disposal options for the contaminated dredged materials that may not be compatible or appropriate for disposal in the CDF.

For these reasons, the Preferred Alternative is expected to contribute to an efficient, cost effective performance of the long-term remedial action for the entire NPL site in compliance with CERCLA 104(a)(2) and USEPA's guidance for NTCRA's (USEPA 1993). The CDF also reduces risks associated with long-distance and/or intermodal transportation of materials to offsite disposal facilities. Consolidation of sediments in a CDF would also be consistent with the approach that USEPA adopted for the CB/NT Superfund Site in Washington.

## **Findings on Cost Effectiveness– Reserved for USEPA**

### **Q-5.3 Feasibility of Disposal Options**

The EE/CA evaluated technical and administrative feasibility of the Removal Action alternatives. A summary of the evaluation is presented below.

#### **Technical Feasibility**

The Preferred Alternative is the most technically feasible of the active alternatives because it employs the most widely utilized contaminated sediment management technology – dredging followed by CDF

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disposal in Slip 1. Slip 1 has been evaluated and was found to be ideal for construction of a CDF (See EE/CA Appendix K). The Preferred Alternative is most compliant with the NTCRA requirement “to avoid wasteful, repetitive, short-term actions that do not contribute to the efficient, cost-effective performance of a long-term remedial action” (USEPA, 1993) because it presents a dredged sediment disposal option for other sites within the Portland Harbor Superfund Site. In short, the Preferred Alternative has the potential to contribute to the efficient, cost-effective performance of a long-term remedial action for the entire Superfund Site because it provides disposal options that are nearby, efficient, and cost-effective and that decrease sediment management and handling.

The Preferred Alternative also presents the potential for the least disruption of tenant operations, because it can facilitate the use of high-productivity dredges and the associated rapid removal of sediments from Slip 3.

Alternatives A, B and D rely on transportation to upland landfills, which may slow down the production and present the most potential for disruption of tenant operations. The Port will have limited control over the availability of transportation and timing.

Upland landfill disposal will most likely involve dewatering prior to disposal. Dredged sediments would require a transload facility to offload sediment into confined stockpile areas upland prior to loading onto truck or rail. The decant water generated from this rehandling process would be treated as necessary to meet water quality standards and then discharged back to the Willamette River or otherwise appropriately disposed. Additional dewatering may also be required to reduce the possibility of spilling during transport. After the sediment has been dewatered, it would be loaded into trucks or rail for transfer to the landfills.

Alternatively if transport were by barge, no transload facility would be required. However, barges have limited capacity and barge transport is relatively slow. The contractor would be required to supply several barges to allow dredging to continue while full barges traveled to and from the landfill. This may impact timing of the project and disrupt operations at Terminal 4 longer than necessary because the availability of barges is unknown at this time. (Appendix B of the EE/CA provides additional detail regarding disposal and transport options to upland landfills.) Note that some regional landfills have taken steps to gain regulatory approval to accept contaminated sediments that contain free liquids, i.e., to waive a requirement that the material pass a paint filter test. Because the sediment would not have to be dewatered, such landfills may offer advantages related to time, cost, and convenience.

Alternatives A and B exhibit comparable technical feasibility because of their similarity. Both alternatives are considered technically feasible; however, both alternatives have a somewhat higher potential for recontamination, thus potentially are less compliant with the above-cited NTCRA requirement.

Alternative D is considered to exhibit the least relative performance because it involves the dredging, handling, transportation, and disposal of the most sediment. Alternative D therefore involves the most onsite and offsite construction activities, not only those associated with dredging but also those associated with the establishment of ancillary facilities (e.g., transloading, rail or road upgrades, dewatering), as well as the greatest transportation requirements.

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## **Administrative Feasibility**

Administrative feasibility refers to requirements associated with coordination with other offices and agencies, including statutory limits, waivers, and requirements for permits for offsite actions.

Among the Removal Action alternatives, Alternative D was considered to have the lowest administrative requirements because it involves the least amount of capping on State of Oregon land and thus requires the least administrative coordination (i.e., no need for DSL negotiation in Slip 1). Alternatives A and B are considered equal in their administrative requirements.

Initially, the Preferred Alternative will have the most administrative requirements because it impacts the largest area of State of Oregon land and may require the most administrative coordination with other agencies to facilitate construction of the CDF. However, after the CDF is operational, the net effect of the Preferred Alternative will be to reduce permitting and other administrative requirements for other projects for which disposal of dredged materials will be in the Slip 1 CDF.

## **Findings on Feasibility– Reserved for USEPA**

### **Q-5.4 Aquatic Impacts from Disposal**

#### **Summary of Baseline Conditions**

The physical conditions in the Terminal 4 Removal Action Area are typical of similar areas in the Lower Willamette River, with highly developed shorelines, relatively soft and fine-grained sediments in areas of slack current, and subsurface topography that has been altered to accommodate marine terminal operations (Altman et al., 1997). All features of the shoreline and in-water areas in the Removal Action Area have resulted from such modifications including dredging, filling, armoring shorelines against wave action and scouring flow, and construction of seawalls and piers to facilitate maritime operations. None of the in-water or shoreline areas of the Removal Action Area are native, although beaches have formed through natural processes in Wheeler Bay, at the head of Slip 1, and inshore from Berth 401. A similar narrow beach that had formed at the head of Slip 3 was recently modified to accommodate a Removal Action in the upland areas east of Slip 3. The modifications have resulted in deep open-water habitats in navigational areas of Slip 1 and Slip 3, as well as along the harbor navigation channel on the riverward side of the Removal Action Area.

Upland habitat adjacent to the Removal Action Area is also limited because of surrounding industrial and maritime facilities. Vegetated, shallow beach areas are located at the head of Slip 1 and Slip 3. The remaining shoreline is steep and in most areas is armored with riprap above the ordinary high water line and/or hardened structures such as building foundations. In some areas above the shoreline, the Port has revegetated slopes with native grasses and shrubs. These areas are primarily located along the south bank of Slip 1 west of Berth 408, extending to the riverward bank between Slip 1 and Wheeler Bay. The area

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above the seawall north of Berth 414 has also been revegetated. After the 2004 remedial action in the Slip 3 upland, the bank at the head of Slip 3 was also revegetated with native species.

The modifications do not prevent use of the Removal Action Area by fish and wildlife, and use of the Removal Action Area by certain introduced fish species such as black crappie, smallmouth bass, and carp is known. Various species of native sculpin were collected from both slips during the harbor-wide RI/FS. Use of the site by juvenile salmonids has not been characterized, but the Removal Action Area may provide some side-channel habitat for out migrating individuals.

Benthic habitats in the Willamette River are generally divided into three types:

1. unconsolidated sediments (sands and silts) in the deeper water and lower channel slopes;
2. unconsolidated sediments (sands and silts) in shallower areas; and
3. developed underwater structures such as rock riprap, sheet pile walls and bulkheads.

All three habitat types are found at the Removal Action Area. The deeper habitat with typically unconsolidated sediment tends to be in the center of Slips 1 and 3 and in the outer portions (i.e., riverward) of Wheeler Bay. Shallow-water areas are found at the margins of the slips and Wheeler Bay, under docks and piers, and in uncovered areas. Sediment Profile Imaging conducted for the harbor-wide RI/FS revealed benthic organisms typical of soft-bottom sediments in what is now the Removal Action Area (Winward Environmental, 2004).

Since implementation of the Preferred Alternative would result in loss of habitat in Slip 1, baseline habitat features were mapped in the Removal Action Area. The mapping was based on general physical features that are known to affect use by fish and wildlife species. The following features were mapped and areas or lengths quantified:

- **Shallow water habitat (<20 feet deep):** shallow water is the most biologically active zone, particularly in nearshore areas;
- **Shallow water habitat with relatively gradual (<20% was arbitrarily chosen) bed surface slope:** subyearling juvenile Chinook salmon, and other species appear to prefer shallow sloping areas;
- **Deep water habitat (>20 feet deep):** mapped to distinguish these areas from shallow water habitat;
- **Area of inundated pilings:** in-water pilings provide structure preferred by some resident species such as smallmouth bass, largemouth bass, walleye; and
- **Shoreline conditions:** beaches, vegetated banks (within 20 meters of waterline), seawalls, rip-rap, and overwater structures affect use of the adjacent aquatic habitat.

The relative quantities of each of these habitat features in the Removal Action Area are shown in Table Q-2. Figure Q-6 shows the location of habitat types under current conditions in the Removal Action Area. This information will be used to support identification of compensatory mitigation needs once the

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Preferred Alternative has been selected by USEPA and design details are available for quantifying impacts.

## **Potential Impacts from Aquatic Disposal**

Disposal of dredged sediments for Removal Action Alternatives A, B, and D will occur at an USEPA-approved offsite landfill. Alternatives A and B would include dredging of 105,000 cy of contaminated sediment, primarily from Slip 3 from a dredge area of 9.2 acres. Alternative D would include dredging of 204,000 cy from a dredge area of 24.7 acres. All materials dredged from each of these alternatives would be transported via one or more modes including truck, rail, or barge to an offsite upland landfill. The aquatic impacts of offsite contaminated sediment disposal are considered to be low because no contaminated sediments would be disposed in the Removal Action Area resulting in no loss of aquatic habitat or habitat function.

The Preferred Alternative would include dredging of 105,000 cy of sediments from Slip 3 (the same as under Alternatives A and B) and 10,000 cy of sediments from Slip 1 where the containment berm would be constructed. Dredged materials would be disposed in the CDF planned for Slip 1, which would include an area of 15.3 acres. Construction of the CDF in Slip 1 would result in the loss of 15.3 acres of total aquatic area, including approximately 3.1 acres of shallow water (i.e., <20 feet deep), 11.5 acres of deepwater, 0.2 acres of vegetated shallows or wetlands, 3.5 acres of inundated piling areas, and 3,317 linear feet of shoreline which is comprised of various structures, unclassified fill, seawalls, and riprap.

While the Preferred Alternative will impact aquatic habitat, the CDF would benefit, and likely stimulate, the harbor-wide cleanup by providing a cost-effective disposal option. The net impact on aquatic habitat for the overall Portland Harbor Superfund Site will be to improve the habitat quality of the Willamette River as a whole by providing a cost-effective disposal option for contaminated sediments. Moreover, the extent to which the CDF results in a net loss in the relative function and value of these habitats will be evaluated and compensatory mitigation will be required. A process for identifying appropriate mitigation measures is presented in Section Q-7.

The area affected by the CDF will create 17 acres for water-dependent use consistent with the Port's maritime strategic goals and promote regional economic vitality of a working harbor.

## **Findings on Aquatic Disposal Impacts – Reserved for USEPA**

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## **Q-5.5 Conservation and Recovery**

Potential effects of the Removal Action alternatives on threatened or endangered species are evaluated in Appendix P – Biological Assessment (BA). The evaluation focuses on two types of impacts: (1) short-term impacts that occur during the construction; and (2) effects of habitat loss resulting from construction.

Short-term impacts occurring during construction are equivalent among the alternatives since activities and volumes of discharged materials are similar. Short-term adverse effects include increased turbidity, disturbance of contaminated sediments, and initiation of fright responses in salmonids as a result of equipment working. After evaluating the potential effects and available scientific and commercial data, the BA concluded that the Removal Action alternatives would result in a “likely to adversely affect” determination for the five federally listed Pacific salmonids/Evolutionary Significant Units (ESUs).

This determination is based on the potential for short-term effects associated with project implementation. In addition, work area isolation may require the relocation of salmonids from the work areas. Actions that are planned to protect against short-term effects are generally described in Section Q-7, and are standard practices used in sediment actions.

Capping and dredging may change the overall distribution of shallow water habitats in the Removal Action Area, but a net loss of potential habitat for protected species is not expected for Removal Action alternatives A, B, and D. If more advanced design identifies a net loss in terms of the relative function and value of aquatic habitat, the loss will be evaluated and mitigated, as appropriate, in accordance with applicable federal and state ARARs.

As noted previously, placement of the CDF would result in permanent loss of aquatic habitat in Slip 1. The importance of the existing Slip 1 habitat to listed species is not known. However, the Port has committed to mitigating the loss of habitat associated with the CDF, in terms of the relative function and value, as appropriate, by acquiring or enhancing habitats of equal or greater ecological quality.

## **Findings on Contribution Toward Conservation and Recovery – Reserved for USEPA**

## **Q-5.6 Limit Number of Disposal Sites**

At the CB/NT Superfund Site, USEPA “sought to minimize the number of disposal sites, while considering the project purpose and volume of sediment that requires disposal.” At CB/NT, USEPA chose CDFs for the disposal of most of the contaminated material dredged from the waterways, with a small portion of the most contaminated material going to a regional landfill. Based on input from the public, USEPA sought to minimize the number of disposal sites by maximizing the capacity of CDFs constructed in nearby waterways, including Blair Slip 1 and CDF constructed in the St. Paul Waterway.

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Based on the dredged material volumes estimated for Removal Action Alternatives A, B, and D, existing upland disposal facilities have adequate capacity for expected quantity of sediment from the Terminal 4 Removal Action. However, the offsite disposal associated with these alternatives will not provide the opportunity to minimize the disposal sites in the Superfund Site by integrating Terminal 4 disposal with cleanup in other locations of the Superfund Site. In addition, the offsite disposal would require intermodal transportation and associated added cost and risk from increased handling of the materials. If rail transport is required due to limited truck availability, construction of a barge-to-rail transloading facility would be required.

The volume of contaminated dredged material associated with future clean-up projects associated with the Portland Harbor Superfund site is currently unknown, but is likely to be much greater than the volume being dredged from the Removal Action Area. Construction of the CDF associated with the Preferred Alternative, would minimize impacts associated with handling dredged materials from the Removal Action Area. With the excess capacity, the CDF could similarly reduce impacts associated with dredged materials from elsewhere in the Portland Harbor Superfund Site. Thus Slip 1 CDF would benefit the harbor-wide cleanup because it is likely to be a cost-effective disposal option that would also reduce risks associated with long-distance and/or intermodal transportation of materials to offsite disposal facilities.

### **Findings on Limiting Number of Disposal Sites – Reserved for USEPA**

#### **Q-5.7 Determination Regarding Evaluation of Disposal Site Alternatives Pursuant to Site Criteria**

### **Determinations reserved for USEPA**

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## ***Q-6. Determination on Significant Degradation, Either Individually or Cumulatively, of the Aquatic Ecosystem***

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### **Q-6.1 Evaluation of Impacts on Ecosystem Function**

As defined in 40 CFR 230.11(g)(1), cumulative impacts are the changes in the aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material into waters of the United States. Although the impact of a particular discharge may constitute a minor change in itself, if not mitigated, the cumulative effect of numerous discharges in an area can result in a major impairment of the water resources and interfere with the productivity and water quality of the existing ecosystem.

The Removal Action alternatives evaluated are relatively similar in scope, with the exception of the Preferred Alternative, which includes the construction and filling of a CDF in Slip 1 to existing grade. The proposed dredging and capping activities associated with each of the alternatives will have temporary adverse impacts on the aquatic ecosystem and organisms. Discharge of fill materials for capping activities will destroy existing benthic invertebrate communities and disrupt fish access to the project area temporarily during implementation of the Removal Action. Post-Removal Action implementation will provide for clean substrates that will be quickly recolonized by benthic invertebrates and access to the project area to fish will be reopened. It is expected that the reduction of exposure to contaminants will provide a significant overall improvement over existing conditions for aquatic organisms as the result of the Removal Action.

Dredging and filling due to cap construction are not expected to result in a net change in habitat in the Removal Action Area. Distribution of shallow-water habitat may change due to changes in elevation from the cap and shoreline conditions may also change due increases in the extent of vegetated shorelines. However, the net change, if any, associated with capping and dredging cannot be determined until more advanced engineering design is available for the selected alternative. As noted previously, if the Removal Action is found to result in a net loss in the relative function and value of this habitat, the loss will be evaluated and mitigated, as appropriate, in accordance with applicable federal and state ARARs.

Construction of the CDF will eliminate 15.3 acres of the sediment bed surface presently available for aquatic organisms in Slip 1. With loss of this habitat will come loss of ecosystem function from this locality. Appropriate compensatory mitigation for this loss will be identified and completed.

The primary objective of the Removal Action is to reduce contaminant exposure to ecological receptors. While removal of contaminated sediment has obvious benefits, aquatic habitat in Slip 1 will be lost and will require compensatory mitigation. Once compensatory mitigation is considered, potential impacts due

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to loss of this habitat are not expected to have overall detrimental effects to the function of the aquatic community in the Lower Willamette River.

During construction, use of the project area by resident and migratory fish and resident and migratory birds will be minimized due to the disruptive activities. Placement of the clean cap sediments will result in the immediate loss and/or displacement of existing benthic and epibenthic organisms. It is expected, however, that complete re-colonization will occur upon completion of construction and the development of healthier community will ensue. Impacts will be short in duration and minor in nature. The overall improvement of habitat quality and ecosystem function, because of removal and/or isolation of the contaminated sediments, will result in a long-term benefit. The dredge and capping impacts are not considered to be significant either individually or cumulatively.

As defined in 40 CFR 230.11(h), secondary effects are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.

### **Q-6.1.1 Dredging and Capping Impact Evaluation**

#### **Alternative A**

Alternative A emphasizes MNR supplemented with dredging and capping at the most contaminated locations with the Removal Action Area. Dredging is slated for 9.2 acres of Slip 3. In total, under Alternative A capping is slated for 20 acres with the largest proportion of acreage to be capped in Slip 1. While temporary impacts to aquatic ecosystem function will occur due to implementation of this Removal Action alternative, the effects are expected to be localized to the Removal Action Area and temporary. No net loss of habitat is expected to occur due to actions associated with Alternative A.

#### **Findings on Alternative A – Reserved for USEPA**

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## **Alternative B**

Alternative B emphasizes capping supplemented with dredging and MNR. Dredging is slated for 9.2 acres of Slip 3. Capping will be conducted in a total of 24.2 acres under this Removal Action alternative. While temporary impacts to aquatic ecosystem function will occur due to implementation of this alternative, the effects are expected to be localized to the Removal Action Area and temporary. No net loss of habitat is expected to occur due to actions associated with Alternative B.

### **Findings on Alternative B – Reserved for USEPA**

## **Alternative C**

Alternative C emphasizes dredging with development of a full at grade CDF. Capping and MNR will supplement the dredging. Dredging is slated for 9.2 acres of Slip 3 and 1 acre in Slip 1 for berm construction. In total, 15.3 acres of habitat will be lost in Slip 1. Of that 3.1 acres are shallow (<20 feet deep) water habitat. Table Q-2 shows the baseline conditions of existing estimated habitats. Approximately 11.5 acres of deep water (>20 feet deep) habitat will be lost. None of the habitat present in the less than 20 foot depth range has a slope of 20% or less, thus no habitat in this category will be lost. There are areas of inundated pilings (3.5 acres) which will be lost due to implementation of Alternative C. Overhead pier structures account for 1.6 acres of Slip 1 habitat, and due to implementation of Alternative C, these areas will also be lost. It is important to note that these acreages are not cumulative: therefore a total of all areas in each habitat type is not practical.

Shoreline bank conditions will also be lost due to implementation of Alternative C. Construction of the CDF will eliminate a total of 3,317 linear feet of structures, unclassified fill, and riprap shoreline bank types. Of the habitats affected by construction of the CDF, the most important habitat is expected to be the <20 foot depth habitat.

### **Findings on Alternative C – Reserved for USEPA**

## **Alternative D**

Alternative D emphasizes dredging to be supplemented with capping and MNR. Dredging is slated for 9.2 acres of Slip 3. Dredging in Slip 1 under this alternative will be conducted in 15.5 acres. The total dredging acres is 24.7 acres. Total capping acres is equal to approximately 8.7 acres. While temporary impacts to aquatic ecosystem function will occur due to implementation of Alternative C, the effects are expected to be localized to the Removal Action Area and temporary. No net loss of habitat is expected to occur due to actions associated with Alternative D.

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## Findings on Alternative D – Reserved for USEPA

### Q-6.2 Evaluation of Impacts on Recreational, Aesthetic, and Economic Values

Based on USEPA's NPL Site Narrative for the Portland Harbor (<http://www.epa.gov/superfund/sites/npl/nar1606.htm>), recreational fishing occurs throughout the Lower Willamette River basin. Species most desired are spring chinook, steelhead, coho, shad, and white sturgeon. Spring chinook contribute substantially to the mainstem Columbia River sport fishery and consistently support the largest recreational fishery in the Lower Willamette River. The chinook fishery in the Willamette River occurs between Oregon City and the confluence of the Willamette and Columbia Rivers. The salmonid fishery is supplemented by hatchery fish, which are the fish primarily available for harvest.

The extent to which the Removal Action Area is used for salmonids fishing is not known, but is not typical habitat for migrating adult salmonids. Informal interviews conducted by USEPA indicate recreation fishing for introduced species such as smallmouth bass and black crappie occurs in the Removal Action Area, especially in Slip 3.

Alternatives A, B, C and D include different combinations of capping and dredging for specific areas in the Removal Action Area. Capping and/or dredging to be conducted under each of these alternatives would have temporary effects. In reaction to construction activities, fright response may lead to fish being temporarily driven from the area. Fish may be exposed to suspended sediments during dredging and cap placement. Construction activities in Slip 3 will prevent fishing in the area during the times of construction. However, no long-term loss of fishing opportunities is expected for Alternatives A, B, and D, and elimination of contaminant exposure will contribute to a healthier fishery for the area.

Under the Preferred Alternative, 15.3 acres of aquatic habitat and associated fishing opportunities in Slip 1 would be lost due to construction of the CDF in Slip 1. Habitat functions lost due to implementation of the Preferred Alternative will require mitigation.

In addition to recreational fishing, recreational boating occurs in the Lower Willamette River together with commercial shipping. However, Terminal 4 is located off the main channel; therefore recreational use of the waterway outside of the Terminal 4 area will likely not be impeded. Because Terminal 4 is an active marine terminal, implementation of the proposed alternative will be conducted in a manner that limits recreational boating. Dredge and capping activities in the Terminal 4 Removal Action Area are not expected to impact water-related recreation.

Aesthetic quality is subjective and is difficult to evaluate. The Terminal 4 Removal Action Area is located within an Industrial Sanctuary which is typified by shorelines and in-water areas that are highly developed to support marine commerce. With the exception of Wheeler Bay, shorelines in Removal Action Area current consist of rip-rap armored banks, seawalls, or pier and overwater structures. The Port has revegetated areas above the high water mark between Slip 1 and Wheeler Bay, and above the seawall in the area north of Berth 414.

Under Alternatives A, B, and D, the overall character of the shorelines would either remain unchanged, or would be improved by removal of debris, and revegetation with native species. The same is true for the

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Preferred Alternative, except that bank areas would be lost from the outer sections of Slip 1. The face of the CDF containment berm would be similar to rip-rapped areas currently found in the Removal Action Area.

Recreational boating and aesthetics in the Removal Action Area are not expected to be significantly affected by implementation of any of the alternatives. The Removal Action Area is located within an industrial marine area in the Lower Willamette River, thus the character of the Site will not be altered due to implementing the project. As an active marine terminal and industrial facility, access to the Site from land is limited and requires entry through the Port security gate. Overall, the removal and isolation of contaminated sediments will provide for a long-term net benefit to the environment.

Under Alternatives A, B, and D, short-term disruption of marine facilities will occur, but long-term impacts are not expected. Under the Preferred Alternative, economic values are expected to be positively impacted. Construction of the CDF will provide approximately 17 acres of land surface in the Slip 1 area. The additional land will be retained by the Port for water-dependent uses consistent with its current core marine businesses. Marine loading and offloading facilities will be modernized and relocated to the riverfront, increasing efficiency of maritime operations. Overall, development of the property will improve marine facilities along Portland working waterfront, and strengthen the Port's competitive position and ability to support the local economy.

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## ***Q-7. Determination on Inclusion of All Appropriate and Practicable Measures to Minimize Potential Harm to the Aquatic Ecosystem***

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### **Q-7.1 Impact Avoidance and Minimization Measures**

Conservation or effects-minimization actions were presented in the preliminary draft BA (Appendix P to the EE/CA) and are presented here as preliminary actions to consider in development and implementation of the Preferred Alternative. The following information summarizes measures likely to be implemented that would minimize adverse effects of the proposed action on listed species or their habitat. These measures may be modified or added to upon selection and refinement of the plan details for the Preferred Alternative:

1. Minimize turbidity and contaminant release outside of the proposed work areas through use of a silt curtain, or other means, as appropriate.
2. Minimize adverse effects to aquatic species and habitat through water quality monitoring.
3. Minimize adverse effects to aquatic habitat and species associated with chemical contamination and sediment resuspension through use of appropriate dredging and transport technologies.
4. Minimize contamination and turbidity outside of work areas during transport of dredged sediments through use of appropriate technologies.
5. Minimize chemical contamination of aquatic habitat associated with heavy equipment through proper cleaning and prevention of spills.
6. Minimize adverse effects to aquatic species and habitat associated with contamination by minimizing transport and handling of contaminated materials and by disposing dredged material in an onsite CDF.
7. Minimize the potential for adverse effects to salmonids by scheduling, to the degree possible, all in-water work within a work window recommended by Oregon Department of Fish and Wildlife (ODFW), typically July 1 to October 31 and/or a secondary preferred work window of December 31 to January 31.
8. Minimize potential adverse effects of petroleum spills and other construction-related impacts by developing a spill containment and control plan and through identification of acceptable limits of work areas.
9. If site conditions allow for fish relocation, any listed salmonids trapped within the work area would be captured by beach seining or another sampling method and relocated to the Willamette River.

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The effects of relocation would be minimized through use of proper fish sampling and handling techniques.

10. Maintain floating hazardous material containment booms on site where there is potential for release of petroleum or other toxic substances.
11. Implement compensatory mitigation, as appropriate, in compliance with federal and state ARARs, to offset the habitat function and values lost through implementation of the project.

Once USEPA has selected the Preferred Alternative, and the design details of the Preferred Alternative have been identified, planning for habitat mitigation can be conducted. Opportunities for mitigation projects that match the type and scale of impacts in the Removal Action Area will be evaluated and discussed with resource agencies. The Port will then formally propose a mitigation plan to fulfill the requirements identified through discussions with the agencies. The following section describes a conceptual process for identifying compensatory mitigation for lost habitat.

## **Q-7.2 Compensatory Mitigation Measures**

### **Q-7.2.1 Process for Identifying Compensatory Mitigation**

The Port has conducted the EE/CA consistent with USEPA guidance for conducting a NTCRA. Based on the outcome of the EE/CA, the Preferred Alternative includes construction of a CDF in Slip 1 for final isolation of contaminated sediments dredged from Slip 3. The Preferred Alternative also includes capping in some areas of Slip 3, and in more riverward sections of the Removal Action Area. A CDF will be built to grade and will result in elimination of aquatic habitat in Slip 1. In accordance with CWA 404(b)(1) provisions, compensatory habitat mitigation is likely to be required to replace the lost habitat functions.

A process for identifying an appropriate mitigation project is needed to help ensure that the lost habitat functions are adequately replaced. The mitigation project will likely involve a combination of mitigation actions. Existing information is adequate to generally identify the types and approximate amounts of affected habitats under each of the Removal Action alternatives. This information can be used to identify the general types of mitigation actions and size of the mitigation projects that may be needed. However, selection of the Preferred Alternative by USEPA and more advanced design of the removal action is necessary before a mitigation project can be proposed. The following is intended to provide general steps for addressing the mitigation needs.

1. Final Action Memorandum – A final decision from USEPA on the Preferred Alternative is needed to identify the conceptual removal action alternative and specifies requirements, including process for developing mitigation requirements and criteria.
2. Refined characterization of affected habitat based on Removal Action Design – The preliminary draft BA and 404(b)(1) analysis memoranda provides a description of the physical characteristics of the

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habitat in the Removal Action Area based on conceptual design. Once USEPA selects the alternative and more advanced design is available, the specific areas of the site affected will be identified and the habitat affected will be characterized in more detail. The types of habitats and areas will be identified based on existing information from the site include:

- a. Bathymetry
  - b. Shoreline types and information
  - c. Substrate information
  - d. Detailed design for the Removal Action
3. Identification of Mitigation Project– Based on the identified habitats, the Port will identify and propose a mitigation project(s). The Port is one of the largest landowners in the Lower Willamette Valley and has access to potential mitigation projects in multiple areas along the Willamette River and the Columbia River. The Port’s current preference is that the mitigation project be on Port property, or on non-Port property to which the Port can reasonably assume access and control. However, projects available through other local agencies such as the City of Portland, or Metro may be considered if projects on Port property are considered unacceptable.

Based on an evaluation of candidate projects, the Port will propose mitigation project(s), which will likely involve a combination of mitigation actions matched to the anticipated habitat losses. Regional information on habitat types and ecological site uses will be used to identify effective mitigation actions. Sources include:

- a. Recently released (February 2005) reports from ODFW describing use of habitat types by juvenile salmonids and resident fishes. These reports provide a basis for identifying the habitat improvements that are most effective for promoting survival and growth of juvenile salmonids.
- b. Biological Assessments and Biological Opinions issued for projects in the Lower Willamette River basin. These documents provide valuable information on the types of actions that resource agencies have considered to be most protective of protected species such as salmonids.
- c. Habitat Evaluation Procedure (HEP) models or other tools available from natural resource agencies for assessing wildlife use. These documents will be used primarily to provide information on the types of habitats needed to promote survival and growth of wildlife species including amphibians, waterfowl, and aquatic-feeding mammals.

It is anticipated that the Port will meet with USEPA and, as appropriate, personnel from state or federal natural resource agencies, tribes or other stakeholders. During these meetings, the Port will present conceptual details of the proposed project, including drawings and limited engineering characterization needed to support approval of the project. The result of this process will be identification of the mitigation actions that are adequate to offset habitat losses due to the removal action and approval of the conceptual mitigation project.

4. Draft Mitigation Plan – Once the mitigation project has been identified, the Port will prepare a mitigation plan which will identify the site, mitigation requirements, engineering requirements, permitting requirements, and approximate costs. This conceptual plan will be submitted to USEPA for review and comment.

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5. Final Mitigation Design – Once the conceptual mitigation plan has been approved, a final mitigation design will be prepared. Submittal of this design is intended to coincide with the final engineering and design for the Removal Action.
  6. Schedule –
    - a. Conceptual Plan Proposal(s) – 90 days after Action Memorandum finalized by USEPA - Coincident with submittal of the Conceptual (30 percent) Design
    - b. Draft Mitigation Plan – Coincident with submittal of Prefinal (60 percent) Design
    - c. Final Mitigation Plan – Coincident with submittal of Final Design

### **Q-7.2.2 Criteria for Identifying Projects**

The Commencement Bay 404 (b)(1) document relied upon a framework for the Commencement Bay-wide conservation and recovery strategy presented as part of the of the Simenstad (2000) report. It focused on broad landscape attributes and ecosystem processes (i.e., landscape ecology) that promote juvenile salmon utilization of existing and potential habitats. While the report does not specify or set priorities on discrete actions, it does identify criteria to guide selection of sites and actions. Those criteria are modified herein to address Lower Willamette River watershed issues:

- 1) All compensatory mitigation must be consistent with the established mitigation strategies, conservation initiatives, or precedence from mitigation projects that have been approved.
- 2) Preference will be given to compensatory mitigation plans that are consistent with habitat function.
- 3) All compensatory mitigation plans will include an assessment of how they contribute toward the conservation and recovery of ESA listed species.
- 4) Mitigation plans must include consideration for connectivity.
- 5) The potential success of the mitigation projects will be specifically factored into habitat plans.
- 6) All compensatory mitigation plans will include measurable performance objectives, management, monitoring and reporting requirements, responsibilities, and schedule.
- 7) Native species only will be utilized in any plantings to the maximum extent practicable.
- 8) Mitigation plans should include facility design and site plans for any development/redevelopment that occurs as a result of a fill. The facility and site plans must ensure that the facility and site characteristics and functions do not create adverse impacts to water, sediment, and habitat quality during construction and operation.

Compensatory mitigation plans will be developed pursuant to these performance criteria and in consultation with USEPA and resource agencies, and be submitted to and approved by USEPA during the Removal Action Design. USEPA may consider mitigation proposals that do not meet all of the performance criteria if the Port demonstrates that the proposal otherwise contributes to conservation and recovery of ESA listed species.

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## ***Q-8. Other Factors in the Public Interest***

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### **Q-8.1 Need for the Action**

The need for a Removal Action is based on the presence of contaminated sediments in the Removal Action Area. In some areas, concentrations of the contaminants exceed SQGs that represent concentrations at which sediments may be toxic to benthic organisms that live in the sediments and experience direct exposure to contaminated sediments. Other forms of aquatic life, avian and mammalian wildlife, and humans may be indirectly exposed to sediment contaminants if they eat biota that have become contaminated from Removal Action Area sediments. As a result of the contaminated sediments, the need for a NTCRA was identified and the EE/CA performed.

Each of the Removal Action alternatives includes dredging sediments, primarily from Slip 3, but also from other subareas of the Removal Action Area. Dredged sediments will require disposal. The disposal method included in the Preferred Alternative is construction of a CDF in Slip 1. Benefits of using the CDF Alternative include:

- Providing a nearby location for isolating contaminated sediments once dredged. The other Removal Action alternatives included disposal at an approved upland landfill facility.
- Excess capacity of the CDF will be greater than the volume of sediments to be dredged from the Removal Action Area. The excess capacity would be available for disposal of contaminated dredged materials from other locations in the Portland Harbor Superfund Site.
- The Slip 1 CDF would benefit, and likely stimulate, the harbor-wide cleanup because it is likely to be a cost-effective disposal option that would also reduce risks associated with long-distance and/or intermodal transportation of materials to offsite disposal facilities.
- Construction of the CDF in Slip 1 would also be consistent with Port's strategy to improve marine facilities for tenants at Terminal 4. Marine loading and offloading facilities will be modernized and relocated to the riverfront, increasing efficiency of maritime operations by shifting bulk loading and unloading operations from berths in the slips, to berths on the main navigation channel. Implementation of the Preferred Alternative will also create approximately 17 acres of land surface. The additional land will be retained by the Port for water-dependent uses consistent with its current core marine businesses. Overall, development of the property will improve marine facilities along Portland's working waterfront, and strengthen the Port's competitive position and ability to promote regional economic vitality.

### **Q-8.2 Fish and Wildlife**

Implementation of the Preferred Alternative will benefit fish and wildlife in the Lower Willamette River. Contaminated sediments that presently exist in the Removal Action Area at Terminal 4 pose a potential risk to

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the environment and human health. As described in Section Q5.4, although the Removal Action Area and Terminal 4 are highly developed for maritime commercial uses, some wildlife, including threatened and endangered fish species, other native and non-native fish species, amphibians, and other wildlife use the site to varying degrees. Although the Preferred Alternative would result in loss of aquatic habitat at the site, compensatory mitigation will be conducted that will result in habitats and ecological function of equal or higher value. Section Q-7 above identifies preliminary actions to minimize the effects of implementing a remedial action in the Removal Action Area as well as a process for developing a compensatory mitigation plan.

### **Q-8.3 Water Quality**

The 2002 ODEQ 303(d) list identified the following parameters as impairing one or more designated uses in the lower Willamette River, from the mouth to River Mile 24.8: fecal coliform, biological criteria, dieldrin, aldrin, DDT/DDE, PAHs, PCBs, mercury, manganese, iron, pentachlorophenol, and temperature (during the summer months). Water quality in this segment of the river is impaired.

Only limited water quality data are available in the immediate vicinity of the Removal Action Area. Water quality data were collected as part of the RI for Slip 3 (Hart Crowser, 2000). Metals, high-molecular-weight PAHs, and phthalates were detected at three sampling locations. No exceedances of the ambient water quality criteria were identified for any of the water samples analyzed.

Subpart G of this document provides details on testing conducted by the Port during the Site Characterization to evaluate short and long term water quality effects due to dredging and construction and fill of the CDF. These tests included dredging elutriate tests (DRET) to assess short-term water quality impacts during dredging, column settling tests (CSTs) to assess settling velocity, modified elutriate tests (MET) to assess short-term water quality impacts of the CDF, and thin-column leaching tests (TCLTs) to assess long-term water quality impacts of the CDF. Analyses of these results were developed as part of the EE/CA (Appendix K). A summary of the findings from these efforts is presented below:

1. Based on the results of the DRET sample analyses, some short-term water quality impacts due to dredging are expected to occur. These impacts would be mitigated by the development and implementation of a water quality monitoring plan.
2. Preliminary fate and transport analyses showed that water quality would meet the criteria for existing long-term water quality standards. The containment berm provides sufficient isolation and buffering to prevent liquid-phase contaminants from reaching the Willamette River. Furthermore, it is expected, that given the MET and DRET results, surface water quality criteria will be met within a 300-foot dilution zone (typical for dredging water quality monitoring).

Temporary perturbations of water quality in the immediate area of construction are expected and are unavoidable. Dredging and capping construction activities are anticipated to cause some resuspension of contaminated sediments into the water column and partitioning of chemical contaminants to their dissolved phase. These perturbations are expected to be localized and temporary. No long-term adverse impacts on water quality are anticipated.

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Likewise, filling of the CDF in Slip 1 may include effluent return flows. Modeling conducted as part of the EE/CA in Appendix K to assess the feasibility of the CDF indicates that the ponding depth during initial filling will be large, and preliminary analyses indicate that short-term water quality will not be affected even at high dredge production rates (i.e., greater than 8,000 cy per day). As additional material is brought in from sites outside of Terminal 4 and as the CDF approaches its capacity, the dredge production rate may have to be reduced to meet water quality standards.

Removal or isolation of existing contaminated sediments within the Removal Action Area is expected to result in improved water quality conditions. Furthermore, the proposed cap will be designed to be effective in isolating contaminants from the water column. Locations within the Removal Action Area will be carefully monitored in accordance with the CERCLA compliance requirements that will be reflected in the equivalent 401 water quality certification for the action. No long-term impacts to water quality are expected.

#### **Q-8.4 Historic and Cultural Resources**

No parks, natural or historical monuments, national seashores, wilderness, research sites, or similar preserves are located near the Removal Action Area. No impacts to these resources are expected due to implementation of the Removal Action alternatives.

#### **Q-8.5 Activities Affecting Coastal Zones**

The Willamette River is a tidally influence river, but it is an entirely freshwater ecosystem. None of the proposed Removal Action alternatives will affect coastal zones.

#### **Q-8.6 Environmental Benefits**

Each of the Removal Action alternatives is expected to result in substantially cleaner sediments and reduce risks to the environment and human health. The Preferred Alternative is expected to provide an overall net benefit to the Portland Harbor Superfund Site by providing the opportunity to isolate and consolidate contaminated dredged materials within the Site, and to potentially minimize the number of such disposal facilities required in the Lower Willamette River.

#### **Q-8.7 Navigation**

A congressionally authorized navigation channel exists in the Lower Willamette River which is maintained to an average depth of 40 feet. The Army Corps of Engineers has not dredged the Willamette River since 1997, due to it being listed as a “Superfund Site” on the U.S. Environmental Protection Agency’s National Priorities List. The Army Corps of Engineers is currently evaluating the feasibility of a maintenance channel dredging effort for the Columbia River, and 11.6 miles of the

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Lower Willamette River from its mouth to Broadway Bridge. This effort would be conducted entirely within the Terminal 4 Removal Action Area and is not expected to impede navigation in the Lower Willamette River.

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## **Q-9. Conclusions**

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Removal Action Alternatives A, B, and D include disposal of dredged materials at one or more offsite landfills. This option was determined to be available, cost-effective, and feasible. The landfills have available capacity and operational life to accept the anticipated volume of materials from Removal Action Area. Use of the landfills would also not result in loss of aquatic habitat. However, although the engineering safeguards are available for transportation of the dredged material, the added handling and transport distance increases the risk of other environmental effects. In addition, specific modes of transporting materials to the landfills were not proposed because the availability of adequate truck, rail, or barge capacity cannot be confirmed. Use of rail would require construction of a transloading facility at Terminal 4 which may interfere with the maritime commercial operations for which the site is designated. Although Alternatives A, B and D would contribute to the remedial objectives in the Portland Harbor Superfund Site because they reduce risk to human health and the environment, selecting upland landfill disposal for the Terminal 4 Removal Action would not contribute to the cost-effective cleanup for other locations in the Superfund Site.

The CDF disposal option included under the Preferred Alternative (Alternative C) is an available option because the Port owns or controls the majority of land on which it would be built and DSL has indicated a willingness to sell its portion of the land to the Port. The option is also technically feasible using existing engineering technologies, and cost-effective, especially if revenue from disposal of sediment from other sites is realized. The CDF would result in loss of aquatic habitat in Slip 1 but, with adequate compensatory mitigation, no net loss in habitat quality and function is expected. The CDF option results in additional benefits of consolidating and isolating contaminated dredge material at the site, eliminating the need for offsite and intermodal transportation. With the excess capacity, the CDF also offers benefits to sediment cleanup in the Portland Harbor Superfund Site by: (1) minimizing the number of potential disposal sites needed to accommodate the contaminated dredged materials from the Portland Harbor Superfund Site; (2) facilitating consolidation of contaminated materials within the Portland Harbor Superfund Site; and (3) contributing to the efficient, cost-effective performance of the long-term remedial action for the entire Superfund Site because it provides a disposal option that is nearby, efficient, and cost-effective and that decreases sediment management and handling.. These advantages were recognized by USEPA in selection of CDFs as primary disposal sites in the CB/NT.

Also consistent with the CDFs at CB/NT, construction of the CDF at Slip 1 will result in additional land space to improve existing water-dependent commercial uses at Terminal 4. The action is consistent with the Port's strategy to improve the quality of services of the facility and will result in direct and indirect benefits to the local economy.

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## **Q-10. References**

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- Altman, B., C.M. Henson, and I.R. Waite. 1997. Summary of information on aquatic biota and their habitats in the Willamette Basin, Oregon, through 1995. U.S. Geological Survey. Water Resources Investigations Report 97-4023. 85 pp. + Appendices.
- Blasland, Bouck, & Lee, Inc. (BBL). 2004a. Work Plan, Terminal 4 Early Action Engineering Evaluation/Cost Analysis, Port of Portland, Portland, Oregon. February 23.
- Blasland, Bouck, & Lee, Inc. (BBL). 2004b. Characterization Report, Terminal 4 Early Action Engineering Evaluation/Cost Analysis, Port of Portland, Portland, Oregon. September 17.
- Code of Federal Regulations (CFR) 40 CFR 230 2001.
- Friesen, T. A., J. S. Vile, and A. L. Pribyl. 2004. Migratory behavior, timing, rearing, and habitat use of juvenile salmonids in the lower Willamette River. Pages 63-137 in T. A. Friesen, editor. Biology, behavior, and resources of resident and anadromous fish in the lower Willamette River. Final Report to the City of Portland. ODFW, Clackamas.
- Fuhrer, G.J. 1989. Quality of bottom material and elutriates in the lower Willamette River, Portland Harbor, Oregon. USGS Water-Resources Investigation Report 89-4005, Portland, Oregon.
- Hart Crowser. 2000. Remedial Investigation Report Terminal 4, Slip 3 Sediments, Port of Portland, Portland, Oregon. Prepared for Port of Portland, April 2000.
- Hart Crowser. 2002. Dredge Material Characterization Study, Marine Terminal 4, Slip 3. Prepared for Port of Portland, February 2002.
- Knutsen, C.J., and D.L. Ward. 1991. Behavior of juvenile salmonids migrating through the Willamette River near Portland, Oregon: Oregon Department of Fish and Wildlife, Fish Division, Information Report No. 91-5, 17 p.
- Oregon Department of Environmental Quality (Oregon DEQ). Summary of Completed Source Water Assessment Reports for Community and Nontransient Noncommunity Public Water Systems. Source Water Assessment Program (<http://www.deq.state.or.us/wq/dwp/SWACompleteSW.asp>)
- Port of Portland and Ellis Ecological Services. 2004. Biological Assessment – Bank Excavation and Backfill Remedial Action marine Terminal 4, Slip 3 Upland Facility: Addressing Potential Impacts on Federally Listed and Wildlife and their Habitats. Prepared for the U.S. Army Corps Of Engineers.
- Simenstad, C.A. 2000. Draft Commencement Bay aquatic ecosystem assessment: ecosystemscale restoration for juvenile salmon recovery. Published for: City of Tacoma, Washington Department of Natural Resources, and U.S. Environmental Protection Agency. 41 pp.

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This document is currently under review by USEPA and  
its federal, state and tribal partners, and is subject to change in whole or in part.

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- U.S. Environmental Protection Agency (USEPA). 1993. Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA. EPA540-R-93-057. August.
- U.S. Environmental Protection Agency (USEPA). 2000. NPL Site Narrative for the Portland Harbor. <http://www.epa.gov/superfund/sites/npl/nar1606.htm>
- U.S. Environmental Protection Agency (USEPA). 2001. Administrative Order on Consent for Remedial Investigation/Feasibility Study, U.S. EPA Docket Number CERCLA-10-2001-0240.
- United States Army Corps of Engineers (USACE). 1998. Dredge Material Evaluation Framework – Lower Columbia River management Area. Northwestern Division, Portland and Seattle Districts. <https://www.nwp.usace.army.mil/ec/h/hr/Final/>
- Winward Environmental, LLC. 2004. Portland Harbor RI/FS Programmatic Work Plan Appendix B: Ecological Risk Assessment Approach. Prepared for the Lower Willamette Group, April 23, 2004.

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# ***Attachment 1***

## ***404(b)(1) Evaluation [40 CFR §230]***

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## ***Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)***

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The organization of this section corresponds to Subpart C of 40 CFR Part 230. Each subsection presented is a required assessment point to be used in making the factual determinations presented in later sections of this document.

### **Substrate (230.20)**

The Willamette River is tidally influenced in the project area, and bottom substrates are primarily fine sands and silt. Existing substrate within the fill area, which includes areas to be capped, and Slip 1 where the CDF is proposed, will be permanently altered by the discharge of fill materials. The area to be filled is composed of silty sand to sandy gravel sediments containing metal, concrete, wood, and other debris.

Cap-designated areas will be covered with clean fill substrates. While the source of cap materials has not yet been selected, it is expected that the cap materials will be similar to the existing material's composition, bulk, and texture, while also complying with the engineering design requirements for stability. Capped areas will smother existing aquatic benthic invertebrate communities; however, the newly created bed surface will reduce contaminant exposure of benthic invertebrates and fish that consume those invertebrates. Capping will, however, provide a new substrate bed that is expected to be re-colonized by benthic invertebrates, making the effects to the benthic fauna temporary in nature.

Implementation of the Preferred Alternative will eliminate aquatic substrate as useable habitat in Slip 1. Approximately 15.3 acres of sediment bed surface in Slip 1 will be lost, but exposure of benthic invertebrates to contaminants present in Slip 1, as well as those in the areas to be dredged will be reduced substantially.

### **Suspended Particulate Materials/Turbidity (230.21)**

The sediment bed of the Lower Willamette River, in the vicinity of Terminal 4, is predominantly sand and silts (Fuhrer, 1989, Hart Crowser, 2002). These fine grained materials, when disturbed can contribute to the suspended sediment load and water turbidity. Overall, turbidity conditions in the Lower Willamette River appear to fall within the "moderate" turbidity range for a large river. The Port of Portland and Ellis Ecological Services (2004) found that average turbidity levels in the Willamette River, from a relatively close monitoring station located at RM 7.0, were generally higher in the fall and winter with average monthly turbidity levels for December, January, and February of 16, 39, and 47 Nephelometric Turbidity Units (NTUs), respectively. In summer, average monthly turbidity ranged from 4 to 8 NTUs from July through October. In Terminal 4 and particularly the more active Slip 3, turbidity and suspended sediments are affected more by propeller wash and propeller-induced currents than by river-induced currents.

During dredging of sediments and discharge of berm and backfill materials, levels of suspended particulates and turbidity are expected to increase above ambient conditions in the river. Effects are expected to be localized to

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the immediate area of construction and are considered minor but unavoidable. Dredging operations will be carefully monitored and managed to minimize suspended sediment effects onsite and offsite. Management measures may include the use of silt curtains to contain suspended materials, or the use of dredging technologies such as hydraulic dredging to reduce the resuspension of sediments.

Capping also will result in short-term localized increases in suspended particulates through the water column and the river bottom. However, these increases are expected to be minor because of the coarse sediments (primarily sands) used for construction of the cap. Water quality impacts from suspended particulates and turbidity are expected to be minor and short-term in nature for all actions.

## **Water (230.22)**

Limited water quality data are available in the immediate vicinity of the Removal Action Area. Water quality data were collected as part of the RI for Slip 3 (Hart Crowser, 2000). Metals, high-molecular-weight PAHs, and phthalates were detected at three sampling locations. No exceedances of the ambient water quality criteria were identified for any of the water samples analyzed.

Subpart G of this document provides details on testing conducted by the Port during the Site Characterization to evaluate short and long term water quality effects due to dredging and construction and fill of the CDF. These tests included dredging elutriate tests (DRET) to assess short-term water quality impacts during dredging, column settling tests (CSTs) to assess settling velocity, modified elutriate tests (MET) to assess short-term water quality impacts of the CDF, and thin-column leaching tests (TCLTs) to assess long-term water quality impacts of the CDF. Analyses of these results were developed as part of the EE/CA (Appendix K). A summary of the findings from these efforts is presented below:

1. Based on the results of the DRET sample analyses, some short-term water quality impacts due to dredging are expected to occur. These impacts would be mitigated by the development and implementation of a water quality monitoring plan.
2. Preliminary fate and transport analyses showed that water quality would meet the criteria for existing long-term water quality standards. The containment berm provides sufficient isolation and buffering to prevent liquid-phase contaminants from reaching the Willamette River. Furthermore, it is expected, that given the MET and DRET results, surface water quality criteria will be met within a 300-foot dilution zone (typical for dredging water quality monitoring).

Temporary perturbations of water quality in the immediate area of construction are expected and are unavoidable. Dredging and capping construction activities are anticipated to cause some resuspension of contaminated sediments into the water column and partitioning of chemical contaminants to their dissolved phase. These perturbations are expected to be localized and temporary. No long-term adverse impacts on water quality are anticipated.

Likewise, filling of the CDF in Slip 1 may include effluent return flows. Modeling conducted as part of the EE/CA in Appendix K to assess the feasibility of the CDF indicates that the ponding depth during initial filling will be large, and preliminary analyses indicate that short-term water quality will not be affected even at high dredge production rates (i.e., greater than 8,000 cy per day). As additional material is brought in from sites

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outside of Terminal 4 and as the CDF approaches its capacity, the dredge production rate may have to be reduced to meet water quality standards.

Removal or isolation of existing contaminated sediments within the project area is expected to result in improved water quality conditions. Furthermore, the proposed cap will be designed to be effective in isolating contaminants from the water column. Locations within the Removal Action Area will be carefully monitored in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) compliance requirements that will be reflected in the equivalent 401 water quality certification for the action. No long-term impacts to water quality are expected.

### **Current Patterns and Water Circulation (230.23)**

The Willamette River contributes a mean annual discharge of about 38,490 cfs to the Lower Columbia River. Peak flows, with a range of 20,800 to 130,000 cfs, occur in the high rainfall months of November through January. Low flows, with a range of 5,000 to 7,100 cfs, occur in the lesser rainfall months of July through September. Flooding in the Lower Willamette Basin occurs frequently with an average of one or two floods in the winter season, and with severe floods occurring about every ten years. Flows in the Willamette River are significantly regulated by reservoirs and hydroelectric dams located on the tributaries (USACE, 1998). Acoustic Doppler data collected during the site characterization studies showed low current velocities in the slips, with occasional spikes related to vessel activity. The current velocity data illustrate the relative importance of induced currents from ships as compared to river currents. Propeller-induced currents cause circulation and increased velocities and turbidity levels far from the paths that ships take in Slip 3.

Dredging and capping activities are not expected to disrupt current patterns and water circulation at the Removal Action Area or in the Willamette River during and after construction. Implementation of the Preferred Alternative will change water circulation in Slip 1 because this alternative includes construction of an at-grade CDF. While current patterns and water circulation in Slip 1 will be affected, no short-term or long-term effects to the Willamette River current patterns or water circulation are expected.

### **Normal Water Fluctuations (230.24)**

The Lower Willamette River is a tidally influenced river; however, discharges of fill materials will not affect normal water fluctuations in the Willamette River where dredging and capping are implemented. Water fluctuation will be altered in Slip 1 under Alternatives C because this alternative will include an at-grade CDF. The CDF berm will isolate Slip 1 from Willamette River flows that presently fill the slip.

HEC-2 modeling was conducted as part of the CDF feasibility analysis to assess the potential impacts of the CDF on Willamette River flood stage. The preliminary assessment of potential impacts to the Willamette River showed that the rise in flood stage (e.g., at and just upstream of Terminal 4) would be negligible and would meet federal and City of Portland criteria.

### **Salinity Gradients (230.25)**

The Willamette River is tidally influenced, but is an entirely freshwater system. No change is predicted for this parameter.

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## ***Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)***

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The organization of this section corresponds to Subpart D of 40 CFR Part 230. Each subsection presented is a required assessment point to be used in making the factual determinations presented in later sections of this document.

### **Threatened and Endangered and Candidate Species (230.30)**

The Port prepared a preliminary draft Biological Assessment (BA) for the Terminal 4 Removal Action Area which focuses on the Preferred Alternative. The BA, once formally submitted, will include consultations with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service to assure compliance with the Endangered Species Act. Formal consultation with these entities will occur prior to project implementation. Appendix P includes the preliminary draft BA for this project.

As noted in the BA throughout the text, salmonid habitat, particularly shallow quiet water less than 20 feet deep, is present in the Removal Action Area and will be lost in Slip 1 due to implementation of the Preferred Alternative. As shown in Table Q-2, the preliminary estimates based on the present stage of design indicate that about 3.1 acres of less than 20 ft deep habitat is present in Slip 1. This area will be eliminated if the CDF is constructed. Mitigation for the loss of this habitat will be required to replace its function. In addition, about 11.5 acres of deep water habitat will also be lost (i.e., greater than 20 foot deep). Loss of this habitat function will also require mitigation. If Alternatives A, B, or D are selected, no habitat is expected to be lost. These Alternatives involve combinations of dredging, capping, and MNR, the actions for which will cause temporary disturbance to these habitats through sediment removal (dredging) and sediment cover (capping).

The LWG RI/FS Programmatic Work Plan Appendix B: Ecological Risk Assessment Approach (Winward 2004) presents results of a preliminary survey of potential fish habitat that identified preferred habitat for juvenile Chinook salmon at the head of Slips 1 and 3, Wheeler Bay, and Berth 414 area. (i.e., shallow water <20 feet deep). Table Q-5 identifies the quantity of several habitat types in each of the five subareas that may be used by Chinook salmon and other salmonid species. As indicated previously, actions that apply technologies such as capping and dredging will not result in a loss of shallow water habitat or deep water habitat. If the Preferred Alternative is implemented, the following habitat types will be lost in Slip 1 due to filling of the CDF:

- <20 ft Water Depth (acres) - 3.1
- >20 ft Water Depth (acres) - 11.5
- <20 ft Water Depth, <20% Slope (acres) - 0
- Inundated Pilings (acres) - 3.5
- Overhead Pier Structures (acres) - 1.6
- Total Shoreline Length (ft) - 3317

No Threatened, Endangered, or Candidate amphibians were noted in the US Fish and Wildlife Service database used to compile the list of species for the BA. Based on the information used to compile the list of species, two species of concern were listed including northwestern pond turtle and northern red legged frog. The LWG

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RI/FS Programmatic Work Plan Appendix B: Ecological Risk Assessment Approach (Winward 2004) indicates that a preliminary survey of potential amphibian habitat was conducted and that potential habitat for amphibians is present at the head of Slip 1 near Berths 408 and 409 and Slip 3 near Berth 411. The exact quantity of habitat is unknown, but it is limited in size. Based on the locations indicated in the above stated Work Plan, it appears that this habitat would be found near the wetland and vegetated shallows described in the sections that follow. Compensatory mitigation for habitat lost in Slip 1 as a result of constructing a CDF is expected to provide equivalent habitat function for these species.

The preliminary draft BA conducted for the Terminal 4 Removal Action Area found that no adverse effects were anticipated for Threatened and Endangered terrestrial wildlife that may potentially utilize the project area or the adjacent action area. For fish species, the preliminary draft BA found that the Removal Action is restorative in nature relative to existing conditions of sediment contamination. Short-term adverse effects associated with construction activities including increased turbidity and disturbance of contaminated sediments may occur. Permanent changes in habitat morphology associated with dredging and construction of the CDF will occur. Habitat in Slip 1 will be lost if the Preferred Alternative (Alternative C) is implemented as the Removal Action. Although these short-term impacts and changes to channel morphology may occur, implementation of the Preferred Alternative is not expected to alter quality habitat or those habitat features considered essential to support the life stages of listed fish.

Implementation of the Preferred Alternative would eliminate amphibian habitat present in Slip 1. Dredging and or capping to be implemented under the remaining Alternatives for Slip 1 will likely modify these habitats due to deepening of the bed surface. Dredging in Slip 3 under all of the alternatives will likely modify these habitats present in Slip 3 due to deepening of the bed surface.

### **Fish, Crustaceans, Mollusks and Other Aquatic Organisms (230.31)**

Baseline chemical characteristics of sediments in the Terminal 4 Removal Action Area indicate that concentrations of several inorganic and organic compounds present in sediments may affect benthic invertebrates, fish, and wildlife. Under current conditions, the food chain may be adversely impacted due to the presence of these chemicals. Dredging and capping activities will either remove or isolate the contaminated sediments from exposure to aquatic receptors, precluding the availability of the contaminated sediment throughout the food chain. Discharge of fill materials for capping activities will destroy existing benthic invertebrate communities and disrupt fish access to the Removal Action Area during implementation of the project. Post-project implementation will provide a clean substrate that will be quickly colonized by benthic invertebrates and access to the Removal Action Area by fish will be reopened. As a result of the Removal Action, reductions in contaminants exposure will provide a significant overall improvement over existing conditions for aquatic organisms.

Riprap, rocky substrate, beach areas and/or <20 foot water depths were considered important habitat characteristics for a number of species such as smallmouth bass, Pacific lamprey, common carp, large scale sucker, crayfish, and sculpins in the LWG RI/FS Programmatic Work Plan Appendix B: Ecological Risk Assessment Approach (Winward 2004). Common habitat for all of these species was identified at the head of Slip 3 and in Wheeler Bay. At the head of Slip 1, habitat suitable for those fish species identified above, other than sculpin, was identified.

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Non-mobile benthic communities present in areas slated for capping under any of the alternatives will be smothered by the clean cover. Recolonization of the clean cap material is expected to occur relatively rapidly. No loss of habitat is expected for areas where MNR will be implemented. In the areas slated for dredging (e.g., Slip 3 under Alternatives A, B, and C; and Slip 3 and Slip 1 for Alternative D) contaminated sediments would be removed and a new bed surface would be available for colonization. Under the Preferred Alternative, construction of the CDF would eliminate the habitats described above. In addition, existing piling and pier structures would be inaccessible to species that utilize those structures as habitat once the containment berm is constructed. Consideration of that habitat function will need to be considered as part of developing a mitigation plan.

Some fisheries experts, including the ODFW, believe that exotic piscivorous fishes such as smallmouth bass have significant effects on juvenile salmonids. If so, good habitat for bass may not be good habitat for juvenile salmonids, and replacement of good bass habitat during mitigation may be contrary to promoting successful salmonids passage through the lower Willamette River. It should be noted that some fishery expert's data do not support the position that bass and other piscivorous fish are harmful to salmonids populations. The specific goals of habitat mitigation for fishes will be developed after the Removal Action has been identified.

Implementation of the Preferred Alternative will eliminate the sediment bed surface available for aquatic organisms in Slip 1. These resources will be lost and require mitigation. Once USEPA has selected a Preferred Alternative, and the design details of the alternative have been identified, potential mitigation requirements can be identified and planning for mitigation conducted. Opportunities for mitigation projects that match the type and scale of impacts in the Removal Action Area will be evaluated and discussed with resource agencies.

## **Impacts on Other Wildlife (230.32)**

As an active industrial area, present use of the Removal Action Area by terrestrial wildlife is limited. Bird and wildlife use may be disrupted during construction; however, these impacts will be short-term and localized to the Terminal 4 Removal Action Area.

The LWG RI/FS Programmatic Work Plan Appendix B: Ecological Risk Assessment Approach (Winward 2004) identified potential hooded merganser habitat (i.e., water depths less than 20 feet) located at the head of Slip 3, Wheeler Bay, Berth 414, and a small portion near Berth 401. No merganser habitat was identified in Slip 1. Where habitat was identified (according to the Work Plan), the post construction habitat should be similar to that which exists because capping and/or MNR are identified for these locations and no habitat will be lost.

Potential mink habitat was identified only at the head of Slip 1. The habitat is associated with the small wetland in that area. However, it should be noted that attributes of mink habitat (according to the Work Plan) include connectivity to forest or wetlands and wooded river banks and beaches. There are no forests along the banks of the Removal Action Area. Furthermore, the vegetation present is not connected to other forested areas. The function of these areas, however, will be included in the mitigation plan developed after the Removal Action has been identified.

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## ***Potential Impacts on Special Aquatic Sites (Subpart E)***

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The organization of this section corresponds to Subpart E of 40 CFR Part 230. Each subsection presented is a required assessment point to be used in making the factual determinations presented in later sections of this document.

### **Sanctuaries and Refuges (230.40)**

No sanctuaries or refuges are located in close proximity to the Removal Action Area. The Sauvie Island Wildlife Management Area, a 12,000-acre, state-owned habitat along the bank of the Columbia River is located about nine river miles downstream from the project area. The Willamette Valley National Wildlife Refuge Complex is located 70 miles south of Portland. No wildlife sanctuaries or refuges will be impacted by the discharge of dredge or fill materials.

### **Wetlands (230.41)**

The Port previously conducted a riverbank inventory to assess whether emergent or submergent wetlands are present along Port properties. Their database suggested that a small riverine wetland may be present at the head of Slip 1. Two small areas of vegetated shallows totaling an estimated 0.2 acres were identified in a formal delineation of the area. A survey of the area is currently being conducted to more accurately record the size of the wetlands. Implementation of the Preferred Alternative, particularly the construction and fill of Slip 1 for use as the CDF will result in a loss of these vegetated shallows in Slip 1. Mitigation for the loss of these vegetated shallows will be required.

### **Mud Flats (230.42)**

No mud flats exist in the Terminal 4 Removal Action Area. Discharge of dredge and fill material will not affect mud flats.

### **Vegetated Shallows (230.43)**

Limited shallow-water habitats exist in the Terminal 4 Removal Action Area. Recent information from the Port indicates the presence of two small submerged vegetated areas near the head of Slip 1. Installation of a CDF in Slip 1 will eliminate these areas and will require mitigation.

### **Riffle and Pool Complexes (230.44)**

Riffle and pool complexes are characteristic of smaller order streams and rivers. The Willamette River is a large multi-order river and no riffle pool complexes are found in the Lower Willamette River. Further, the Removal Action Area is located in a man-made terminal area constructed for the purpose of docking ships. Discharge of dredge and fill material will not affect riffle and pool complexes.

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## ***Potential Impacts on Human Use Characteristics (Subpart F)***

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The organization of this section corresponds to Subpart F of 40 CFR Part 230. Each subsection presented is a required assessment point to be used in making the factual determinations presented in later sections of this document.

### **Municipal and Private Water Supplies (230.50)**

Oregon DEQ has defined beneficial designated uses for the Lower Willamette River that include public and private domestic water supply and industrial water supply. Review of Oregon DEQ Source Water Assessment Program's *Summary of Completed Source Water Assessment Reports for Community and Nontransient Noncommunity Public Water Systems* (<http://www.deq.state.or.us/wq/dwp/SWACompleteSW.asp>) indicates that no public surface water systems currently use the Lower Willamette River as a drinking water source. Review of the USEPA's Safe Drinking Water Information System (SDWIS) indicates that there are a number of wells in Multnomah County serving small and medium-sized populations. The actual locations of these wells are not provided as part of the data compilation; however, it is expected that homes near Terminal 4 are served by the City of Portland's water supply, which is derived from the Bull Run watershed, and groundwater from the Columbia South Shore well field. Given the available information, no municipal or private water supplies are expected to occur in the immediate or nearby vicinity of the project area. Discharge of dredge or fill materials at the Terminal 4 Removal Action Area will not affect municipal or private water supplies.

### **Recreational and Commercial Fisheries (230. 51)**

Recreational fishing occurs throughout the Lower Willamette River basin. Species most desired are spring chinook, steelhead, coho, shad, and white sturgeon. Spring chinook contribute substantially to the mainstem Columbia River sport fishery and consistently support the largest recreational fishery in the Lower Willamette River. The chinook fishery in the Willamette River occurs between Oregon City and the confluence of the Willamette and Columbia Rivers. The lower reach of the Willamette River to Willamette Falls provides a migratory corridor for both juvenile and adult anadromous fish and juvenile rearing habitat for several anadromous fish species. Three runs of chinook, two runs of steelhead, and individual runs of coho and sockeye salmon occur in this area (USEPA NPL Site Narrative for the Portland Harbor, available at <http://www.epa.gov/superfund/sites/npl/nar1606.htm>). The salmonid fishery is supplemented by hatchery fish, which are the fish primarily available for harvest.

The Removal Action Area provides some off-channel resting and feeding habitat for salmonids, other native fish species, and non-native exotic species. Habitats include shallow near shore, low gradient areas, deep slack water areas, and cover in the form of structure such as pilings, rip-rap, or other bank protection structures. Relatively consistent findings suggest that shallow, near shore areas are preferred habitats for juvenile salmonids (Knutson and Ward, 1991; Friesen et al., 2004). Areas with structure provide habitat for species such as smallmouth bass, northern pike minnow, and other centrarchid species, among others. Winward (2004) conducted preliminary surveys of aquatic habitats in the Lower Willamette River and identified "optimum" habitat at the heads of Slips 1 and 3, Wheeler Bay, and the Berth 414 area. The designation was based on

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physical characteristics including riprap or other rocky substrates and/or quiescent shallow areas (<20 feet deep).

Alternatives A, B, and D include different combinations of capping and dredging for specific areas in the Removal Action Area. Capping and/or dredging to be conducted under each of these alternatives would have temporary effects. Fish could be exposed to suspended sediments during dredging and cap placement. Fish that use these waterways may contribute to fisheries in areas outside of the waterways. Potential short-term exposure of fish to the dredged sediments is not expected to adversely affect recreation fisheries. Elimination of contaminant exposure pathways due to implementation of the Removal Action will likely contribute to a healthier fishery for the area.

Under the Preferred Alternative, 15.3 acres of total habitat would be lost due to construction of the CDF in Slip 1. Additional acreage would be modified and experience temporary impacts due to either dredging or capping activities in Slips, Wheeler Bay, and Berth 401. Specific areas of habitat types that would be lost are shown in Section 6.1.1 above. Habitat functions lost due to implementation of the Preferred Alternative will require mitigation.

## **Water-Related Recreation (230.52)**

Recreational boating occurs in the Lower Willamette River together with commercial shipping. However, Terminal 4 is located off the main channel; therefore recreational use of the waterway outside of the Terminal 4 area will likely not be impeded. Because Terminal 4 is an active marine terminal, implementation of the proposed alternative will be conducted in a manner to limit any reductions in the use of the Terminal. Dredge and capping activities in the Terminal 4 Removal Action Area are not expected to impact water-related recreation.

## **Aesthetics (230. 53)**

Aesthetic quality is subjective and difficult to evaluate. The Terminal 4 Removal Action Area is located within a relatively congested berthing and industrial waterfront area. Based on our review of the Guidelines, banks of the Terminal 4 Removal Action Area have some limited habitat qualities. Some upper banks have recently been planted by the Port and will not be disturbed by the Removal Action. Many of the other bank areas have substantial amounts of construction debris, concrete blocks, and remnants of buildings. Such materials are often removed from riverbanks as part of mitigation projects. Current conditions of the banks and uplands near the Terminal 4 Removal Action Area are not viewed as aesthetically pleasing areas.

Note that the only areas where bank vegetation will be lost are in Slip 1, and only if the Preferred Alternative is selected. It has long been the Port's policy to revegetate bank areas with native species and control weedy exotic species, even where not required to do so by mitigation or greenway requirements. An example of this activity is the riverbank of T4 adjacent to the Toyota Auto Storage areas.

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**Parks, Natural and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves (230 .54)**

No parks, natural or historical monuments, national seashores, wilderness, research sites, or similar preserves are located near the Removal Action Area.

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## ***Evaluation and Testing (Subpart G)***

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The organization of this section corresponds to Subpart G of 40 CFR Part 230. Each subsection presented is a required assessment point to be used in making the factual determinations presented in later sections of this document.

### **General Evaluation of Dredged or Fill Material (230.60)**

The characterization effort (BBL, 2004b) conducted to fill in existing data gaps, and the remedial investigation (RI) report for Terminal 4, Slip 3 (Hart Crowser, 2000), are the primary sources of data used to evaluate sediment chemical concentrations in the Terminal 4 Removal Action Area. As part of the Site characterization, surface, subsurface, and under-pier sediment chemical analyses were conducted on samples from Slip 1, Slip 3, Wheeler Bay, Berth 401, and North of Berth 414. Additional studies were also conducted as part of the characterization effort to characterize the dredged material in terms of impacts to water quality during dredging and if a CDF is constructed. These tests included dredging elutriate tests (DRET) to assess short-term water quality impacts during dredging, column settling tests (CSTs) to assess settling velocity, modified elutriate tests (MET) to assess short-term water quality impacts of the CDF, and thin-column leaching tests (TCLTs) to assess long-term water quality impacts of the CDF. For offsite disposal alternatives, toxicity characteristics leaching procedure (TCLP) testing and generation and loss of free-liquid testing were conducted to assess if the materials were suitable to be placed in a Subtitle D landfill. The results of these tests are presented initially in the characterization report (BBL, 2004b) and more in-depth analyses of data from these studies are included in the EE/CA to which this document is an appendix.

The tests mentioned above, particularly the DRET, CST, MET, and TCLT are important in assessing potential short and long-term water quality impacts from dredging and installation of the CDF associated with the Preferred Alternative. Results of these analyses are presented below.

### **Evaluation of Chemical-Biological Interactive Effects (230.61)**

#### **Exclusion of the Material from Testing**

The dredged materials are not excluded from testing due to chemical contamination.

#### **Water Column Effects**

Short-term effects due to dredging were evaluated using the DRET. Two composite samples were analyzed: T4-CM1-DRET from Berth 401 and Slip 1 using surface water from Slip 1 and T4-CM2-DRET from Wheeler Bay, Slip 3, and North of Berth 414 using surface water from Slip 3. Results are presented below.

##### **T4-CM1-DRET**

- Of the ten metals analyzed, six were detected, including arsenic, chromium, copper, lead, nickel, and zinc. Arsenic was detected at an exceedance ratio of 50 for the federal consumption of water and organisms and Oregon state water and fish ingestion criteria. The concentration of arsenic was below the other federal and Oregon state criteria. The Willamette River water that was used in the DRET test

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(Table F-2 in Appendix F), contained a concentration of arsenic with an exceedance ratio of 17. Approximately 30% of the arsenic in the DRET result appears to be existing arsenic concentration in the river. The concentration of copper was above the federal maximum and continuous criteria (exceedance ratios of 1.1 and 1.5, respectively) and Oregon state acute and chronic criteria (exceedance ratios 1.4 and 1.9, respectively). The concentration of lead was above the federal continuous criterion and the Oregon state chronic criterion, with exceedance ratios of 3 and 3, respectively. Of the remaining seven metals that were analyzed for, the metals were either detected at concentrations below the federal and Oregon state water criteria or were not detected.

- Of the 23 polycyclic aromatic hydrocarbon (PAHs) compounds analyzed, pyrene was the only PAH detected in the elutriate sample. The total detected PAH concentration was 0.075 micrograms per liter (µg/L) in the elutriate sample. The concentrations of individual PAH compounds were below the federal and Oregon state water criteria. The concentration of total PAHs had an exceedance ratio of 27 for the Oregon state water and fish ingestion. However, this criterion is based on the federal carcinogenic PAH criterion and all carcinogenic PAH were not detected in the sample.
- The six phthalates for which the elutriate sample was analyzed were not detected.
- The six DDT compounds and nine polychlorinated biphenyls (PCBs) for which the elutriate sample was analyzed were not detected.
- Diesel-range total petroleum hydrocarbon (TPH) was not detected in the elutriate sample. Residual-range TPH was detected in the elutriate sample. There are no federal or Oregon state water criteria for residual-range organics.
- TSS and total sulfide were not detected in the elutriate sample. Ammonia was detected in the elutriate sample at a concentration below the federal and Oregon state water criteria.

#### T4-CM2-DRET

- Of the ten metals analyzed, eight metals were detected including: arsenic, chromium, copper, lead, nickel, selenium, silver, and zinc. Arsenic was detected at an exceedance ratio of 44 for the federal consumption of water and organisms and Oregon state water and fish ingestion criteria. The concentration of arsenic was below the other federal and Oregon state criteria. The Willamette River water that was used in the DRET test contained a concentration of arsenic with an exceedance ratio of 22 (Table F-2 in Appendix F). Approximately 50% of the arsenic in the DRET result appears to be existing arsenic concentration in the river. The concentration of copper was above the federal continuous criterion (exceedance ratio of 1.2) and the Oregon state acute and chronic criteria (exceedance ratio of 1.2 and 1.6, respectively). The concentration of lead was above the federal continuous criterion and the Oregon state chronic criterion, with exceedance ratios of 3.4 and 3.4, respectively. Of the remaining seven metals that were analyzed for, the metals were either detected at concentrations below the federal and Oregon state water criteria or were not detected.
- Seven PAHs (acenaphthylene, acenaphthene, 2,3,5-trimethylnaphthalene, fluorene, phenanthrene, fluoranthene, and pyrene) of the 24 PAHs analyzed were detected in the T4-CM2-DRET elutriate

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sample. The total detected PAH concentration was 0.737 µg/L in the elutriate sample. The concentration of individual PAH compounds were below the federal and Oregon state water criteria. The concentration of total PAHs had an exceedance ratio of 263 for the Oregon state water and fish ingestion. However, this criterion is based on the federal carcinogenic PAH criterion and all carcinogenic PAH results were not detected.

- The six phthalates for which the elutriate sample was analyzed were not detected.
- The six DDT compounds and nine PCBs analyzed for which the elutriate sample was analyzed were not detected.
- Diesel-range TPH and residual-range TPH were not detected in the elutriate sample.
- TSS and total sulfide were not detected in the elutriate sample. Ammonia was detected in the sample at a concentration below the federal and Oregon state water criteria.

Based on the results of the DRET sample analyses, some short-term water quality impacts due to dredging are expected to occur. These impacts would be mitigated by the development and implementation of a water quality monitoring plan.

Short-term water quality impacts to assess the impacts from the CDF were assessed using the CST and MET. TCLTs were run to assess long-term water quality impacts of the CDF. Settling velocity as measured by the CST found that during the first 12 hours of the test, average settling velocity was approximately ½ foot per hour. The MET was performed on a composite sediment sample from Wheeler Bay, Slip 3, and North of Berth 414 using deionized water. The resulting MET elutriates were analyzed for both total (T4-CM2-MET-T) and dissolved (T4-CM2-MET-D) fractions. MET results are presented below:

#### Total MET Results

- All ten metals analyzed were detected in the elutriate sample.
- Fifteen of the 24 PAHs analyzed were detected in the elutriate. The total PAH concentration was 2.6 µg/L.
- The six phthalates analyzed were not detected.
- All of the six DDT compounds analyzed were detected in the elutriate sample. The Σ DDTs concentration was 0.0493 µg/L.
- Aroclor 1260 was the only Aroclor detected in the elutriate sample. The total detected PCB concentration was 0.082 µg/L.
- TSS was detected in the elutriate sample.

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### Dissolved MET Results

- Seven of the ten metals analyzed were detected in the elutriate sample, including: arsenic, chromium, copper, lead, nickel, silver, and zinc.
- Six of the 24 PAHs analyzed were detected in the elutriate sample. The total detected PAH concentration was 0.92 µg/L in the elutriate sample.
- The six phthalates analyzed were not detected.
- The only pesticide detected in the elutriate sample was 4,4'-DDE. The Σ DDTs concentration was 0.0024 µg/L in the elutriate sample.
- The nine Aroclors analyzed were not detected.
- TSS was not detected in the elutriate sample.

### TCLT Results

- Nine of the ten metals for which the samples were analyzed were detected in at least one TCLT leachate sample. Those nine metals are arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, and zinc. Mercury was not detected in the TCLT leachate samples. Arsenic was detected in all the TCLT samples at concentrations above the federal consumption of water and organisms criterion and the Oregon state water and fish ingestion criterion. Concentrations of cadmium were above the Oregon state chronic criterion in most of the TCLT samples. Copper and lead were detected in all the TCLT samples at concentrations above the federal and Oregon state water quality criteria.
- Thirteen of the 24 PAHs for which the samples were analyzed were detected in at least one TCLT leachate sample. Individual PAH compounds were detected at concentrations below the water quality criteria with the exception of chrysene in one TCLT sample (T4-CM2-16), which was detected at a concentration above the federal consumption of water and organisms criterion and Oregon state water and fish ingestion criterion. Total PAH concentrations in most of the TCLT samples were above the Oregon state water and fish ingestion criterion.
- The six phthalates for which the TCLT leachate samples were analyzed were not detected.
- Two (4,4'-DDE and 2,4'-DDD) of the six DDT compounds were each detected once in the TCLT leachate samples. The pesticide 4,4'-DDE was detected above the Oregon state water and fish ingestion criterion. The detected concentration of Σ DDTs was above the Oregon state chronic criterion.
- The nine PCBs for which the TCLT leachate samples were analyzed were not detected. Detected total polychlorinated biphenyls (PCBs) were below the water quality criteria.

Tests to assess the short- and long-term water quality impacts due to construction and filling of the CDF were conducted during the Site Characterization, and analyses of these results were developed as part of the EE/CA

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(Appendix K). Preliminary fate and transport analyses showed that water quality would meet the criteria for existing long-term water quality standards. The containment berm provides sufficient isolation and buffering to prevent liquid-phase contaminants from reaching the Willamette River. Furthermore, it is expected, that given the MET and DRET results, surface water quality criteria will be met within a 300-foot dilution zone (typical for dredging water quality monitoring).

## **Effects on Benthos**

Hart Crowser (2000) conducted a RI in Terminal 4, Slip 3 for the Port. Sediment toxicity tests were completed on a subset of the 44 surficial sediment samples collected for characterization. Two phases of testing were conducted. In Phase 1, all sediments passed the biological effects criteria for testing conducted on two species. Samples for these tests were from Slip 3 (western mouth area), Berth 414, and Wheeler Bay. Phase 2 testing resulted in a number of failures (indicating toxicity) of the biological effects criteria in testing for both of the species (*Hyallela azteca* and *Chironomus tentans*). Samples for Phase 2 were largely concentrated in Slip 3 from the center of the slip east to the head of the slip.

Dredging and capping activities are not expected to cause any adverse chemical-biological interactive effects. These actions will address already contaminated sediments; therefore, benthic habitat should be improved with fewer or less severe chemical-biological interactions. Under the Preferred Alternative, construction of the CDF in Slip 1 will eliminate aquatic habitat which is currently contaminated. Effects on the benthos due to this Alternative will eliminate a contaminant source pathway but will also eliminate habitat.

## **Comparison of Excavation and Discharge Sites**

### **Total Sediment Chemical Analysis**

Under Alternatives A, B, and D, the proposed discharge site is in an USEPA approved upland facility. No comparisons can be drawn on the excavation and discharge sites under these alternatives. Dredging and capping are both proposed in the Preferred Alternative. Dredged material disposal will be by placement in the CDF proposed for Slip 1, which is also within the Removal Action Area. Slip 3 is an active marine terminal, whereas Slip 1, where the proposed CDF is to be located, is only occasionally used. While chemical concentrations vary among the subareas, each area is subject to similar chemical contaminants, past industrial uses, and physical conditions. Therefore, other than the level of contaminants, the excavation and discharge site is similar.

### **Biological Community Structure Analysis**

Comparative biological community information from the Terminal 4 Removal Action Area is not available. Within the footprint of the proposed cap areas and CDF area in Slip 1, the existing benthic biological community will be smothered. In areas slated for capping, this loss is unavoidable and judged to be minor, short-term, and acceptable. Capped areas will quickly recolonize and are likely to have more diverse and abundant biological communities due to the absence of contaminants. Habitat lost due to construction of the CDF will be mitigated to provide equivalent habitat elsewhere.

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## **Physical Tests and Evaluations**

A number of physical and engineering property characteristics of sediments in the Removal Action Area were conducted in addition to the settling velocity tests implemented as part of the Site characterization. Results of these studies are described in the Site Characterization Report (BBL, 2004b) and more detailed analysis of these properties is described in the EE/CA to which this document is an appendix.

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## ***Actions to Minimize Adverse Effects and Practicable Steps to Minimize Potential Adverse Impacts (Subpart H)***

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The organization of this section corresponds to Subpart H of 40 CFR Part 230. Each subsection presented is a required assessment point to be used in making the factual determinations presented in later sections of this document.

### **Actions Concerning the Location of the Discharge (230.70)**

Two types of discharge will occur under the Preferred Alternative. Capping will be conducted in Slip 3 under pier areas and certain slopes that cannot be dredged. Additional capping will occur in Wheeler Bay Berth 401. Capping will isolate contaminated sediments in place, and is proposed for locations where dredging is not practical due to the depth of contaminated sediments (+22 feet below the bed surface), physical obstructions such as old piers or old pilings, and/or potential stability issues related to in-use piers. Capping of contaminated sediments with clean fill is therefore an appropriate action to minimize potential adverse effects.

Discharge of dredged materials to the CDF is proposed as a cost-effective alternative to transporting the dredge materials offsite to a landfill. Sediments in the proposed CDF location, Slip 1, contain chemicals similar to those found in the remainder of the subareas. Locating the CDF in Slip 1 is appropriate given that sediments in the slip will require remediation. Measures will be taken to assure minimal suspension of contaminated sediments within the water column during construction of the CDF and from either dredging or disposal activities. Disposal of contaminated materials into the CDF will isolate contaminants; therefore exposure to the aquatic environment will be limited to dredging activities outside the containment of the CDF.

No discharge of contaminated sediments to the aquatic environment will occur under Alternatives A, B, or D because dredged sediments resulting from implementation of any of these alternatives will be disposed of in an USEPA approved offsite upland disposal facility.

### **Actions Controlling the Material to be Discharged, the Material after Discharge, the Method of Dispersion and Related Technology (230.71, 230.72, 230.73, and 230.74)**

At the current stage of design for this project, there is insufficient detail to assess this component of the evaluation. Recommendations that may affect material to be discharged consist of the following:

- Using clean cap materials to construct the containment berm, cap the filled site, and cap contaminated non-dredged areas.
- Use of hydraulic dredge to remove the contaminated sediments and place them within the CDF to minimize potential loss of sediment particles and dissolved chemical constituents to the harbor water column.

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- Designing the discharge of water from the CDF to maximize settling and retention of particulate matter and minimize transport of contaminants back into the harbor.
  - Using chemical flocculants to enhance the deposition of suspended particulates in the CDF.
  - Proper CDF maintenance.
  - Timing of the discharge to minimize impacts.
  - Using silt screens or other appropriate methods to confine suspended particulates.
  - Minimizing water column turbidity by using a submerged diffuser.
  - Defining the rate of discharge (time or volume).
  - Using appropriate equipment, including protective devices.
  - Employing appropriate maintenance and operation of equipment, including adequate training, staffing, and working procedures.

### **Actions Affecting Plant and Animal Populations (230.75)**

Water quality impacts are expected to be short-term, localized and limited to isolated work areas. Impacts would be minimized through implementation of conservation measures. Post-project, water quality and substrate quality would be improved relative to existing conditions. Effects to Chinook and coho salmon EFH are expected to be short-term and localized and include increased turbidity and resuspension of sediments. Water quality and substrate quality are expected to improve post-project. The loss of habitat associated with the CDF, in terms of the relative function and value of the habitat, will be evaluated and mitigated, as appropriate, in accordance with federal and state ARARs.

Indirect effects would include disturbance of benthic food organisms. Dredged areas will experience a short-term reduction in benthic food organisms, however, post-project the quality of sediments and benthic food organisms will be improved. Creation of the CDF will result in permanent (short- and long-term) loss of benthic food production in Slip 1, however, this loss will be mitigated in accordance with federal and state ARARs.

No additional actions are considered necessary beyond the effects-minimization actions proposed in the BA (Appendix P) for the capping and dredging alternatives. Although the Removal Action is restorative in nature relative to existing conditions of sediment contamination, short-term adverse effects may occur associated with construction activities including increased turbidity, disturbance of contaminated sediments, and initiation of fright responses in salmonids as a result of equipment working. Due to industrial and commercial use of this area, it is unknown to what extent juvenile salmonids utilize the 3.1 acres of shallow water habitat in Slip 1 that will be filled. However, the loss in terms of the relative function and value of this habitat will be evaluated and mitigated, as appropriate, in accordance with federal and state ARARs. In addition, loss of deep water habitat, inundated pilings areas, and other in water structures in Slip 1 will be considered in the mitigation plan relative

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to the management goals for the aquatic ecosystem. The footprint of the CDF will occupy 15.3 acres of aquatic habitat

### **Actions Affecting Human Use (230.76)**

The Port will coordinate with the affected public on these actions and will take all appropriate and practicable steps to assure minimal impacts to human use and general appreciation of the area. Future human use of the Removal Action Area will likely have some restrictions that limit digging or drilling that could penetrate the contaminated sediments. It is expected that future use of the Removal Action Area would be limited to "industrial" uses. During construction, normal safety precautions similar for any marine construction/dredging project would be observed. Site and deed restrictions are likely. Mitigation sites are dedicated to their functions in perpetuity; accordingly, some future human uses will be restricted (e.g., commercial development of a mitigation site).

### **Other Actions (230.77)**

The Preferred Alternative is being designed to meet the requirements of CERCLA and appropriate ARARs to control the releases of hazardous substances that may present imminent threat to human health and the environment. These design strategies will minimize effects of the discharge of dredge and fill materials.

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## ***Factual Determinations (230.11)***

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### **Physical Substrate Determinations**

The Preferred Alternative (Alternative C) for the Terminal 4 Removal Action Area includes capping, dredging, MNR, and construction of a full at-grade CDF to isolate dredged materials. Alternatives A, B, and D also include capping, dredging, and MNR. Dredging will be conducted for the most-contaminated sediments that can be practicably dredged. Capping will be conducted where contaminant depths are too great for dredging to be effectively and practicably implemented or where contaminant concentrations are marginally elevated, but still need to be addressed. Implementation of these actions will result in alteration of physical substrates. These alterations are judged to be environmentally beneficial because contaminant concentrations in exposed sediments will be significantly reduced, and sediments in capped areas and the CDF will be immobilized.

Construction of the CDF would include dredging for berm construction, and discharge of dredged materials primarily from Slip 3. The result of installing a CDF in Slip 1 is the loss of useable substrate and water column habitat. Implementation of the Preferred Alternative will result in a loss of 15.3 acres of sediment bed surface, including approximately 3.1 acres of shallow (<20 feet) nearshore areas. Appropriate mitigation measures will be required to offset the loss of this habitat function.

Table Q-2 illustrates the baseline habitat conditions present in each of the five subareas. Under Alternatives A, B, and D, no habitat is expected to be lost. Under the Preferred Alternative, 15.3 acres of aquatic habitat is expected to be lost. Preliminary design information used to estimate habitat quantities, as shown in Table Q-2 indicates that aside from shallow water habitat, approximately 11.5 acres of deep water (>20 feet) habitat would also be lost if the CDF Alternative is implemented. Figures Q-7 to Q-10 illustrate the locations of habitat present in each of the five subareas and the remedial technologies applied to these areas.

### **Water Circulation and Fluctuation Determinations**

Dredging and capping activities are not expected to disrupt current patterns and water circulation at the Terminal 4 Removal Action Area or in the Willamette River during and after construction. Installation of the CDF will change water circulation in Slip 1 and eliminate slack water habitat. HEC-2 modeling was conducted as part of the CDF feasibility analysis to assess the potential impacts of the CDF on Willamette River flood stage. The preliminary assessment of potential impacts to the Willamette River showed that the rise in flood stage (e.g., at and just upstream of Terminal 4) would be negligible and would meet federal criteria.

### **Suspended Particulate Materials and Turbidity Determinations**

The proposed dredging and discharge of capping materials are expected to result in some short-term increases in turbidity. These would be most likely to occur close to where dredging or capping activities are occurring. These potential effects would be mitigated by monitoring water quality in appropriate locations, and implementing best management practices to reduce turbidity if it exceeds acceptable levels. If the hydraulic dredging is selected, the interior of the CDF would be isolated from the river by the berm and no turbidity effects from filling are expected. Best management practices such as silt curtains or other technologies will be

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employed to minimize turbidity outside the CDF. Numerous resuspension containment techniques are available, including controlled placement of the sediment and various containment structures, such as silt curtains and turbidity curtains, for use in meeting water quality criteria set for the construction period of the CDF. A water quality monitoring plan and a plan for implementing best management practices will be submitted with the final design for the Removal Action. Erosion of the closure berm, after construction, is not expected to occur as the slopes will be armored to protect them from flood scour, boat wakes, and/or prop wash.

## **Contaminant Determinations**

Sediments to be dredged and/or capped in the Terminal 4 Removal Action Area contain PAHs, PCBs, DDT, and metals. Concentrations and spatial distributions of contaminants in the Removal Action Area have been appropriately characterized. Discharge of clean fill materials for the purpose of capping will provide a new, clean bed surface that will significantly reduce exposure of ecological receptors to potentially toxic concentrations of contaminants.

Dredge materials to be discharged into a CDF have been adequately characterized to assess potential short-term and long-term water quality impacts. Placement of contaminated dredge materials into a CDF will isolate contaminated sediments completely from future water exposure and will significantly reduce contaminant exposure to ecological receptors. The Preferred Alternative is designed to meet applicable CERCLA requirements to protect human health and the environment.

## **Aquatic Ecosystem and Organism Determinations**

The proposed dredging and capping activities associated with Preferred Alternative will have temporary adverse impacts on the aquatic ecosystem and organisms. Discharge of fill materials for capping activities will destroy existing benthic invertebrate communities and disrupt fish access to the project area temporarily during implementation of the project. Post-project implementation will provide for clean substrates that will be quickly recolonized by benthic invertebrates and access to the project area to fish will be reopened. It is expected that the reduction of exposure to contaminants will provide a significant overall improvement over existing conditions for aquatic organisms as the result of the Removal Action.

Construction of the CDF will eliminate 15.3 acres of the sediment bed surface presently available for aquatic organisms. However, under the current conditions, the available bed surface in Slip 1 is contaminated and the primary objective of the Removal Action is to reduce contaminant exposure to ecological receptors. While this is an obvious benefit, the area in Slip 1 will be lost and will likely require mitigation.

Once USEPA has selected the Preferred Alternative, and the design details of the alternative have been identified, planning for habitat mitigation can be conducted. Opportunities for mitigation projects that match the type and scale of impacts in the Removal Action Area will be evaluated and discussed with resource agencies. The Port will then formally propose a mitigation plan that matches the requirement identified through discussions with the agencies. The formal BA will incorporate the proposed mitigation in the overall assessment.

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## Proposed Disposal Site Mixing Zone Determinations

The preliminary designs of the Preferred Alternative are not adequately developed at this stage of the design to make a determination on the proposed disposal site and mixing zones for discharge of decant water.

Guidelines specify that the mixing zone shall be confined to the smallest practicable zone within each specified disposal site that is consistent with the type of dispersion determined to be appropriate by the application of these guidelines (40 CFR 230.201). In a few special cases under unique environmental conditions, where there is adequate justification to show that widespread dispersion by natural means will result in no significantly adverse environmental effects, the discharged material may be intended to be spread naturally in a very thin layer over a large area of the substrate rather than be contained within the disposal site.

The following factors should be considered in determining the acceptability of a proposed mixing zone:

- depth of water at the disposal site;
- current velocity, direction, and variability at the disposal site;
- degree of turbulence;
- stratification attributable to causes such as obstructions, salinity or density profiles at the disposal site;
- discharge vessel speed and direction, if appropriate;
- rate of discharge;
- ambient concentration of constituents of interest;
- dredged material characteristics, particularly concentrations of constituents, amount of material, type of material (sand, silt, clay, etc.) and settling velocities;
- number of discharge actions per unit of time; and
- other factors of the disposal site that affect the rates and patterns of mixing.

## Determination of Cumulative Impacts on the Aquatic Ecosystem

As defined in 40 CFR 230.11(g)(1), cumulative impacts are the changes in the aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material into waters of the United States. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous discharges in an area can result in a major impairment of the water resources and interfere with the productivity and water quality of the existing ecosystem.

Use of the project area by resident and migratory fish and resident and migratory birds will be minimized during construction due to the disruptive activities. Placement of the clean cap sediments will result in the immediate loss and/or displacement of existing benthic and epibenthic organisms. It is expected, however, that complete re-colonization will occur upon completion of construction and the development of healthier community will ensue. Impacts will be short in duration and minor in nature. The overall improvement of habitat quality and ecosystem function, because of removal and/or isolation of the contaminated sediments, will result in a long-term benefit. The dredge and capping impacts are not considered to be significant either individually or cumulatively.

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Loss of aquatic habitat due to implementation of the Preferred Alternative is not expected to have a cumulative impact on the aquatic ecosystem as long as appropriate mitigation is developed to compensate for the loss of this habitat. It is expected that mitigation will provide for habitat of equal or higher quality that is not contaminated.

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## ***Review of Conditions for Compliance (230.10)***

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### **Availability of Practicable Alternatives**

Based on the EE/CA analysis of alternatives relative to the NTCRA criteria, the Preferred Alternative has been demonstrated to be available and practicable.

### **Compliance with Pertinent Legislation**

Federal and State of Oregon potential ARARs are compiled and used as evaluation criteria for the Preferred Alternative in the EE/CA evaluation. Onsite actions (i.e., those taken within the Portland Harbor Superfund Site) must comply with the substance of any identified legally applicable requirement to the extent practical considering the circumstances of the situation, or receive an ARAR waiver allowed by USEPA guidance under certain circumstances. Onsite actions do not have to comply with the corresponding procedural requirements, such as permit applications, reporting obligations, and record keeping requirements. Other relevant and appropriate requirements will also be considered during design of the Preferred Alternative. Offsite actions must comply with all substantive and procedural legally applicable requirements. Table 8-4 of the EE/CA includes all potential ARARs for the Preferred Alternative. These ARARs include meeting water quality standards, effluent standards, and endangered species act requirements among others. The Preferred Alternative is expected to comply with the ARARs.

### **Potential for Significant Degradation of Waters of the United States as a Result of the Discharge of Polluted Materials**

#### **Impacts on Ecosystem Function**

Implementation of the Preferred Alternative is not expected to result in net significant adverse effects to aquatic ecosystem function. Impacts are expected to be short-term and localized to the project area. Removal and/or capping of contaminated sediments will ultimately provide a net long-term benefit as exposure of contaminants to all life stages of benthic invertebrates and fish will be reduced significantly. Construction of the CDF will result in a loss of aquatic habitat and shoreline in Slip 1. Previous sections have identified the types and quantities of habitats available in Slip 1. Mitigation for the loss of habitat in Slip 1 is expected to minimize long-term potential for significant effects. Potential impacts due to loss of this habitat are not expected to have overall detrimental effects to the function of the aquatic community in the Lower Willamette River.

#### **Impacts on Recreational, Aesthetics and Economic Values**

Recreational boating and aesthetics in the area are not expected to be significantly affected by implementation of the Preferred Alternative. The Removal Action Area is located within an industrial marine area in the Lower Willamette River, thus the character of the Site will not be altered due to implementing the project. As an active marine terminal and industrial facility, access to the Site from land is limited. Access from the water is possible, but not likely given the activity of large vessels in the area and the availability of more pleasing or useable areas at downstream or upstream locations.

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Recreational fishing may be impacted by implementation of the Preferred Alternative due to loss of fish habitat in Slip 1. Available habitats provide areas for foraging and resting for a number of native, non native, and exotic species, some of which are sport fish popular with recreational fishermen. Loss of habitat in Slip1 will require mitigation that balances the management objectives for Threatened and Endangered species with those for sport fish and non sport fish. Overall, the removal and isolation of contaminated sediments will provide for a long-term net benefit to the environment.

### **Steps to Minimize Potential Adverse Impacts on the Aquatic Ecosystem**

The BA that precedes this document in Appendix P includes effects-minimization actions to reduce potential effects due to implementation of the Preferred Alternative. These actions are preliminary in nature and will be refined once the design details of the Preferred Alternative are nearer completion. Section 9 above also provided some recommended actions related to discharge of dredge or fill materials that will be considered.

Once USEPA has selected a Removal Action alternative, and the design details of the alternative have been identified, planning for habitat mitigation can be conducted. Opportunities for mitigation projects that match the type and scale of impacts in the Removal Action Area will be evaluated and discussed with resource agencies. The Port will then formally propose a mitigation plan to fulfill the requirements identified through discussions with the agencies.

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Table Q-1  
Technologies and Quantities for Each Project Subarea  
Terminal 4 Removal Action Area

Alternative	Emphasis	Technology	Slip 1	Slip 3	Wheeler Bay	North of Berth 414	Berth 401	Totals
A	MNR	Dredging acres (CY)	NA	9.2 (105,000)	NA	NA	NA	9.2(105,000)
		Capping acres (CY)	11.3 (54,500)	4.5 (22,000)	3.0 (14,500)	NA	1.2 (5,500)	20 (96,500)
		Monitored Natural Recovery acres	5.9	0.7	4	3	2.3	15.9
		Confined Disposal Facility	NA	NA	NA	NA	NA	NA
B	CAP	Dredging acres (CY)	NA	9.2 (105,000)	NA	NA	NA	9.2(105,000)
		Capping acres (CY)	15.5 (75,000)	4.5 (22,000)	3.0 (14,500)	NA	1.2 (5,500)	24.2 (117,000)
		Monitored Natural Recovery	1.7	0.7	4	3	2.3	11.7
		Confined Disposal Facility	NA	NA	NA	NA	NA	NA
C	Dredge w/ at grade full CDF	Dredging acres (CY)	1.0 (10,000)	9.2 (105,000)		NA	NA	10.2 (115,000)
		Capping acres (CY)		4.5 (22,000)	3.0 (14,500)	NA	1.2 (5,500)	8.7 (42,000)
		Monitored Natural Recovery	0.9	0.7	4	3	2.3	10.9
		Confined Disposal Facility (acres)	15.3	NA	NA	NA	NA	15.3
D	Dredge w/ Land Fill	Dredging acres (CY)	15.5 (99,000)	9.2 (105,000)		NA		24.7 (204,000)
		Capping acres (CY)	NA	4.5 (22,000)	3.0 (14,500)	NA	1.2 (5,500)	8.7(42,000)
		Monitored Natural Recovery acres	1.7	0.7	4	3	2.3	11.7

NA - Not Applicable

Acreages in each area are presented and the associated cubic yards (CY) of materials for those acreages are shown in parenthesis.

Values presented above are based on the values for acreage and cubic yards of materials presented in the EECA, Section 7.

Table Q-2  
Summary of Existing and Potentially Affected Habitats for Each Project Subarea  
Terminal 4 Removal Action Area

Existing Conditions	Slip 1	Slip 3	Wheeler Bay	North of Berth 414	Berth 401	Total Habitat Type
<20 ft Water Depth (acres)	3.1	1.7	4	0.8	1.4	11
>20 ft Water Depth (acres)	11.5	11.7	1.2	1.4	1.2	27
<20 ft Water Depth, <20% Slope (acres)	0	0	3.2	0	0.6	3.8
Inundated Pilings (acres)	3.5	3	0	0	0.8	7.3
Overhead Pier Structures (acres)	1.6	1.8	0	0	0.5	3.9
Total Shoreline Length (ft)	3317	1875	1120	775	779	7866
Bank Type: structures length (ft)	2776	1523	0	696	432	5427
Bank Type: unclassified fill length (ft)	425	352	766	0	347	1890
Bank Type: seawall length (ft)	0	0	0	79	0	79
Bank Type: riprap length (ft)	116	0	354	0	0	470

Bank Types as Classified by the City of Portland (2001).



**TERMINAL 4**  
PORT OF PORTLAND, OREGON

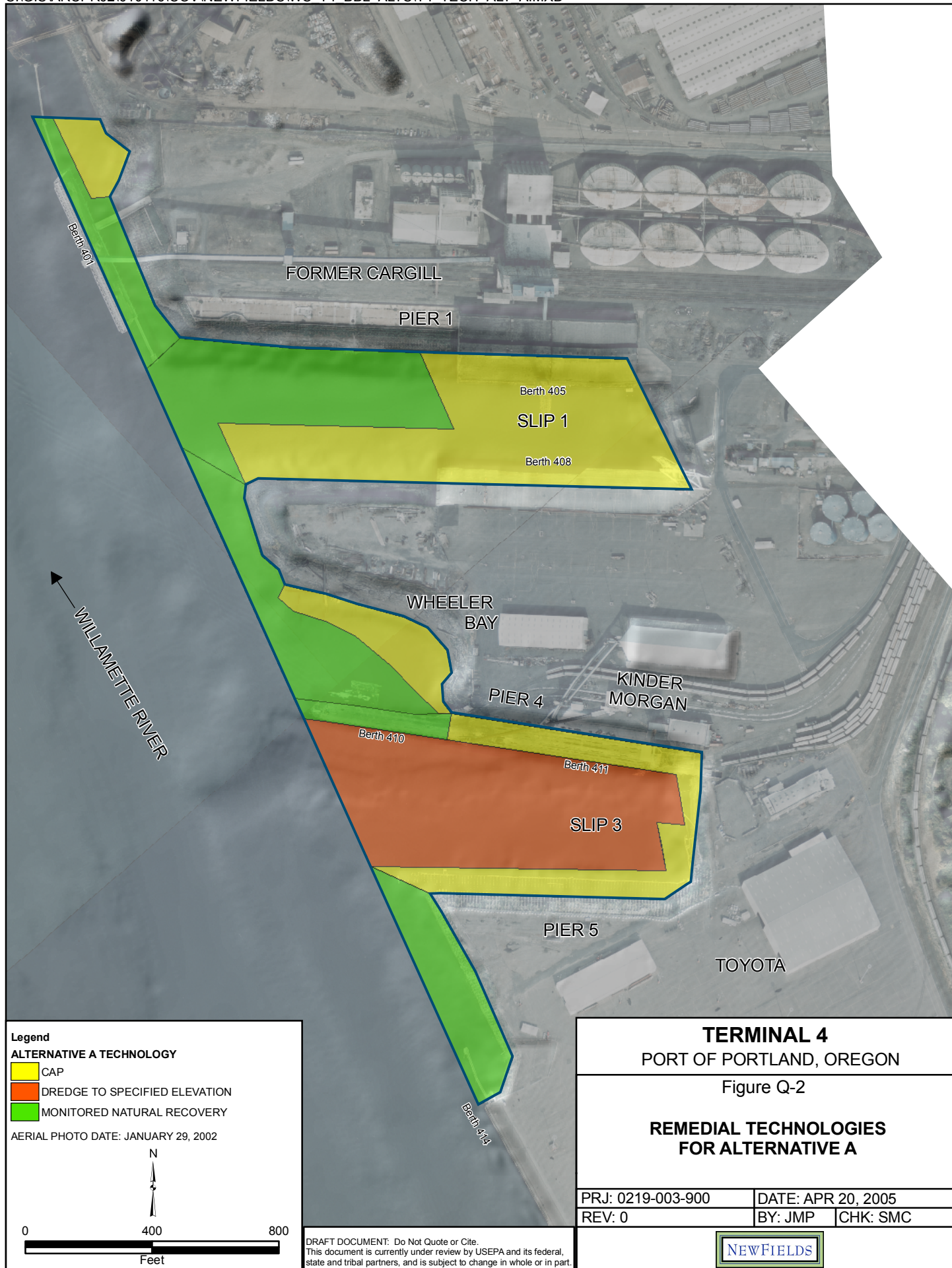
Figure Q-1

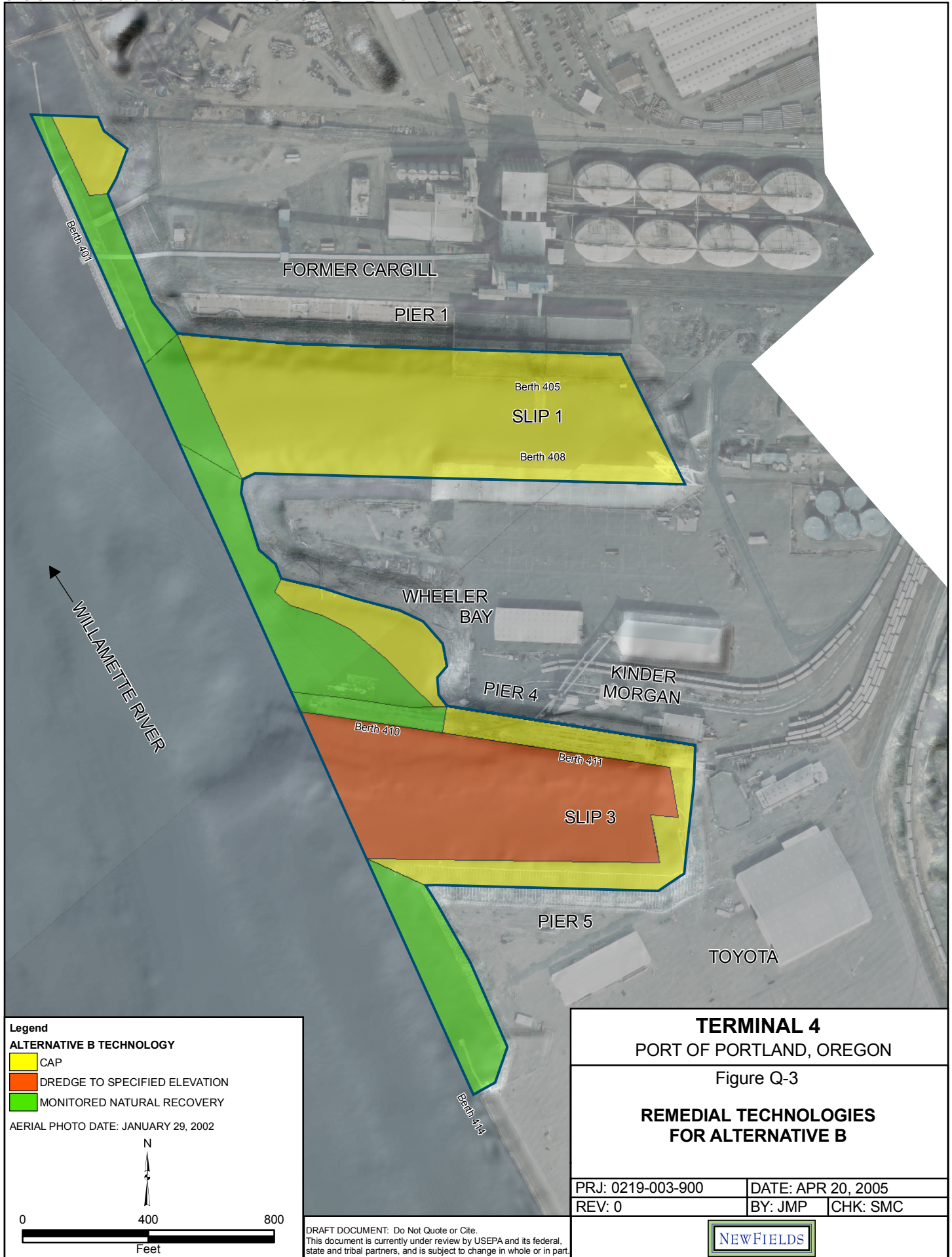
**TERMINAL 4**  
**AERIAL PHOTOGRAPH**  
**(JANUARY 29, 2002)**

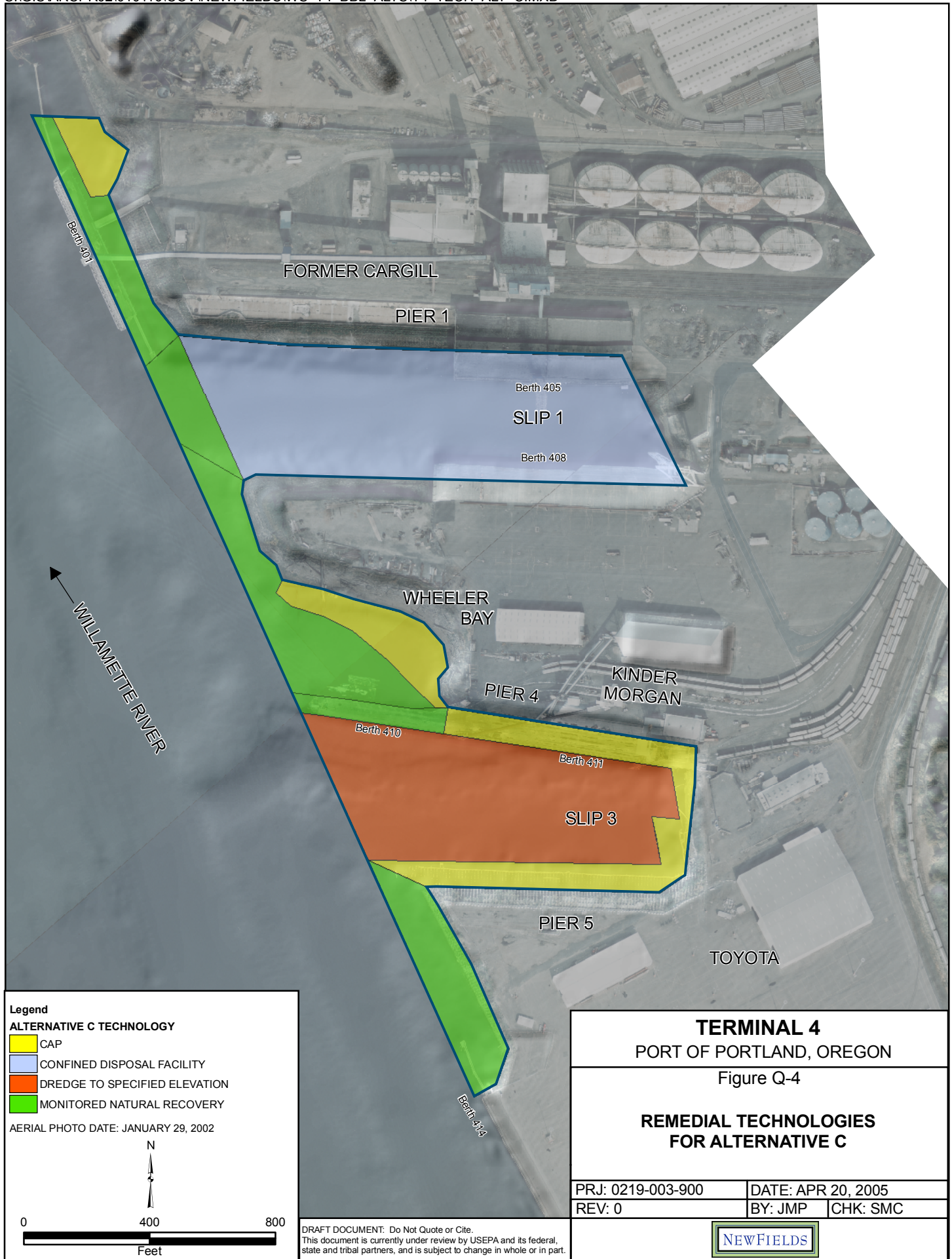
PRJ: 0219-003-900	DATE: APR 20, 2005
REV: 0	BY: JMP CHK: SMC

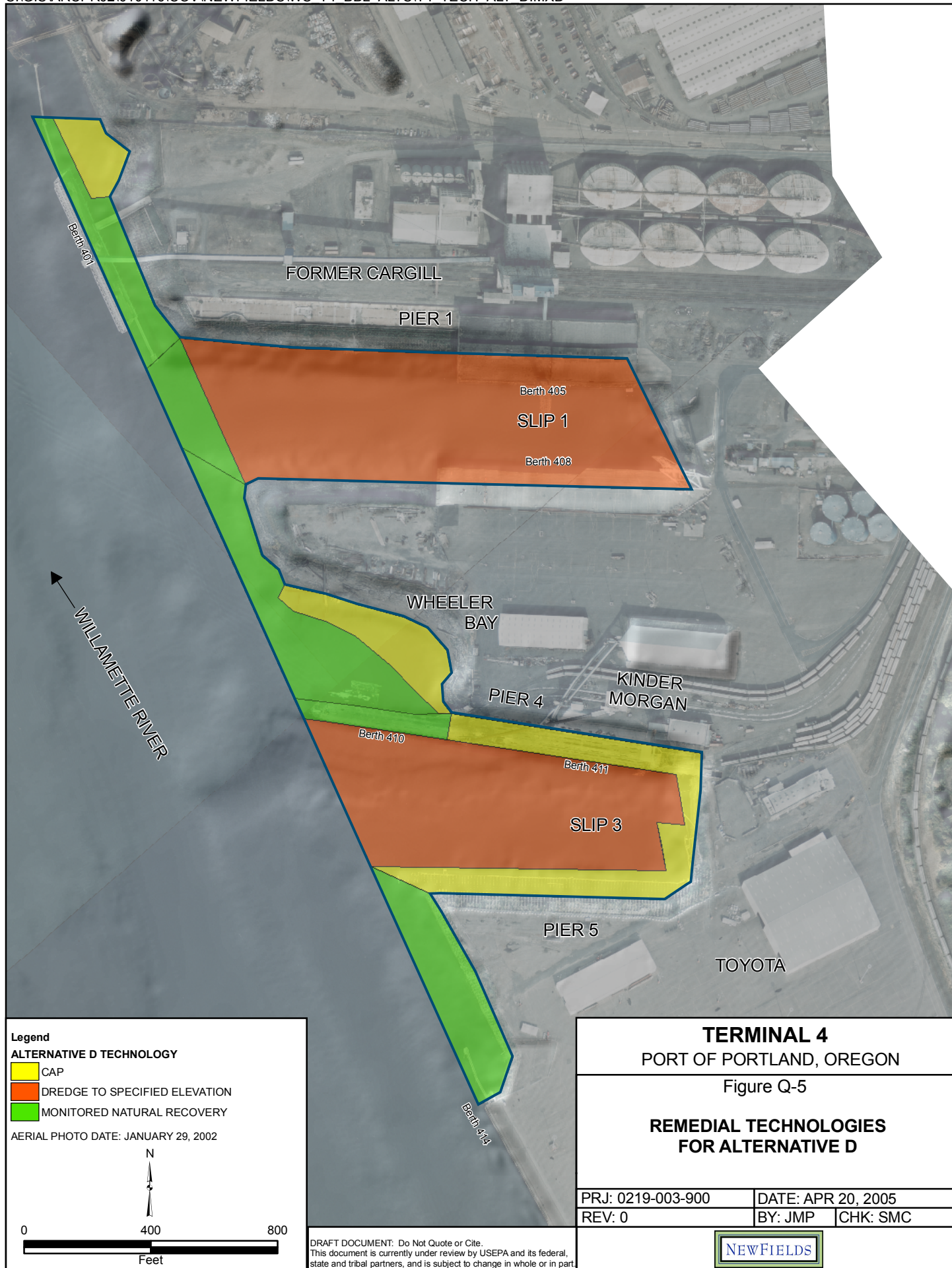
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NEWFIELDS

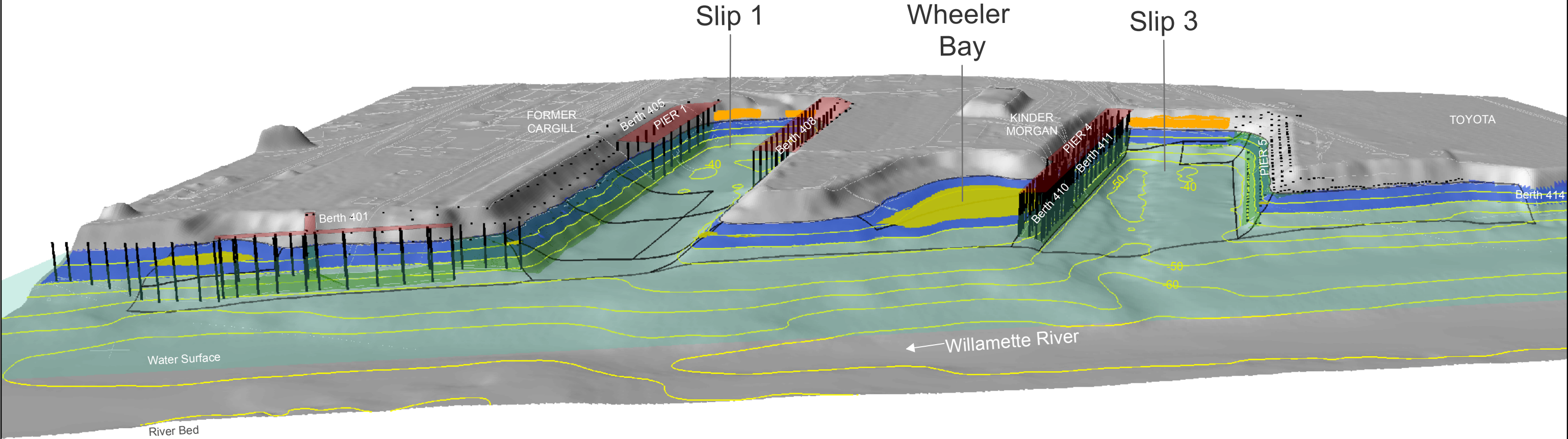








TERMINAL 4



Legend

- Submerged Pilings
- Water Depth <20' WRT +8ft NAVD88
- Water Depth <20' and Slope <20%
- Over Water Structures
- Beach/Vegetated Shallows

Note:  
2X vertical exaggeration

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TERMINAL 4		
PORT OF PORTLAND, OREGON		
Figure Q-6		
EXISTING HABITAT FEATURES		
(CIRCA 2002)		
RELATIVE TO +8ft NAVD88		
WATER LEVEL		
PRJ: 0219-003-900	DATE: APR 19, 2005	
REV: 0	BY: JMP	CHK: MCL
NEWFIELDS		

